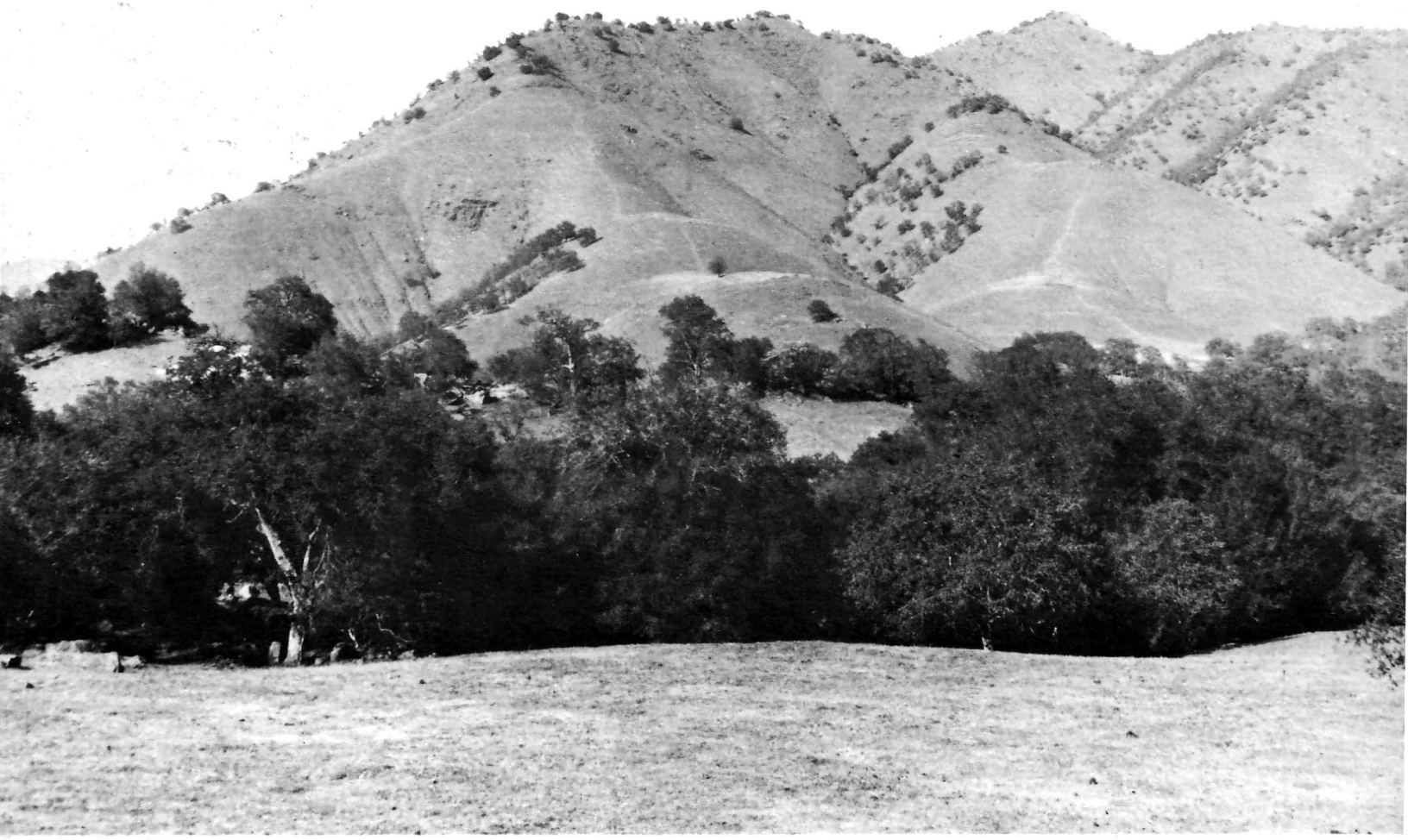
Soil Survey of

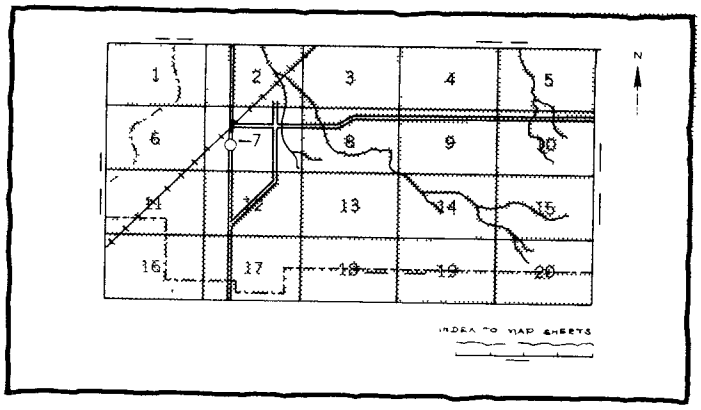
Tulare County, California, Central Part

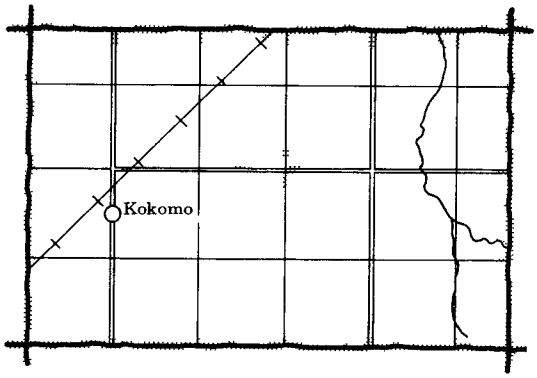


United States Department of Agriculture
Soil Conservation Service and
United States Department of the Interior
Bureau of Indian Affairs
In cooperation with
University of California
Agricultural Experiment Station

HOW TO USE

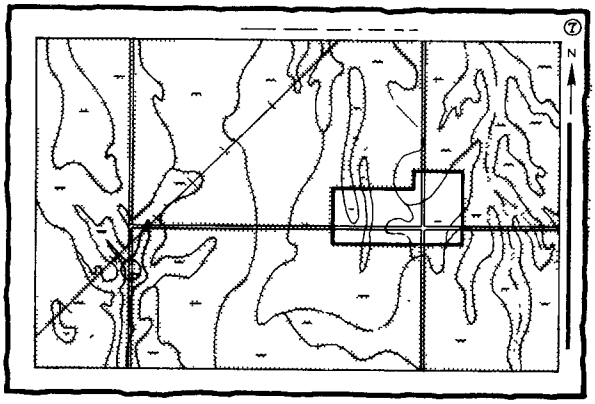
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

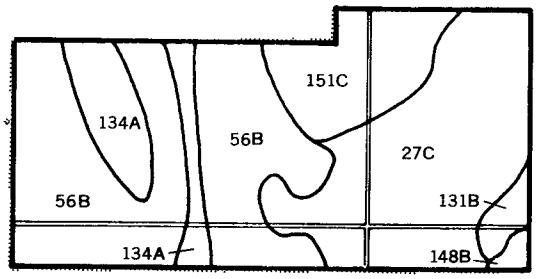




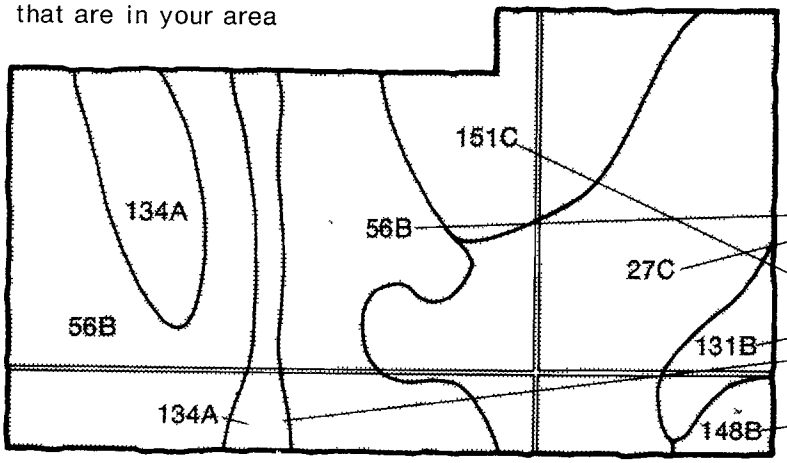
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





4. List the map unit symbols that are in your area



Symbols

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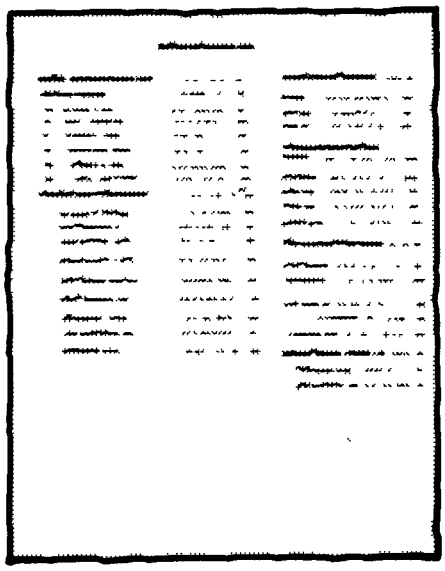
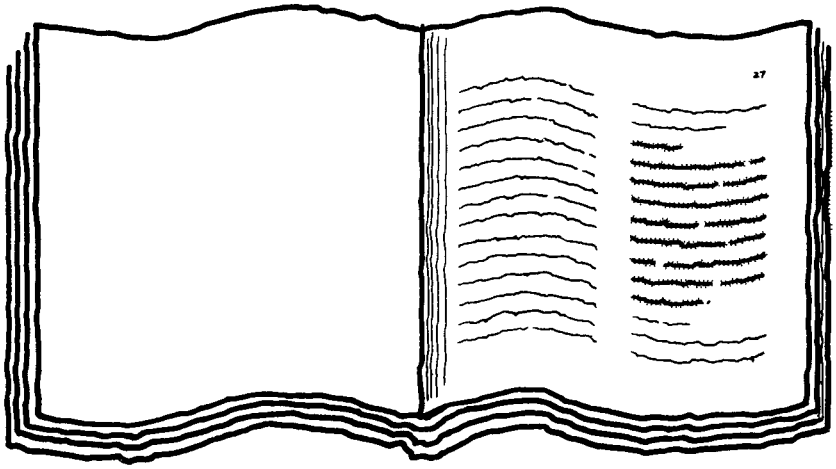
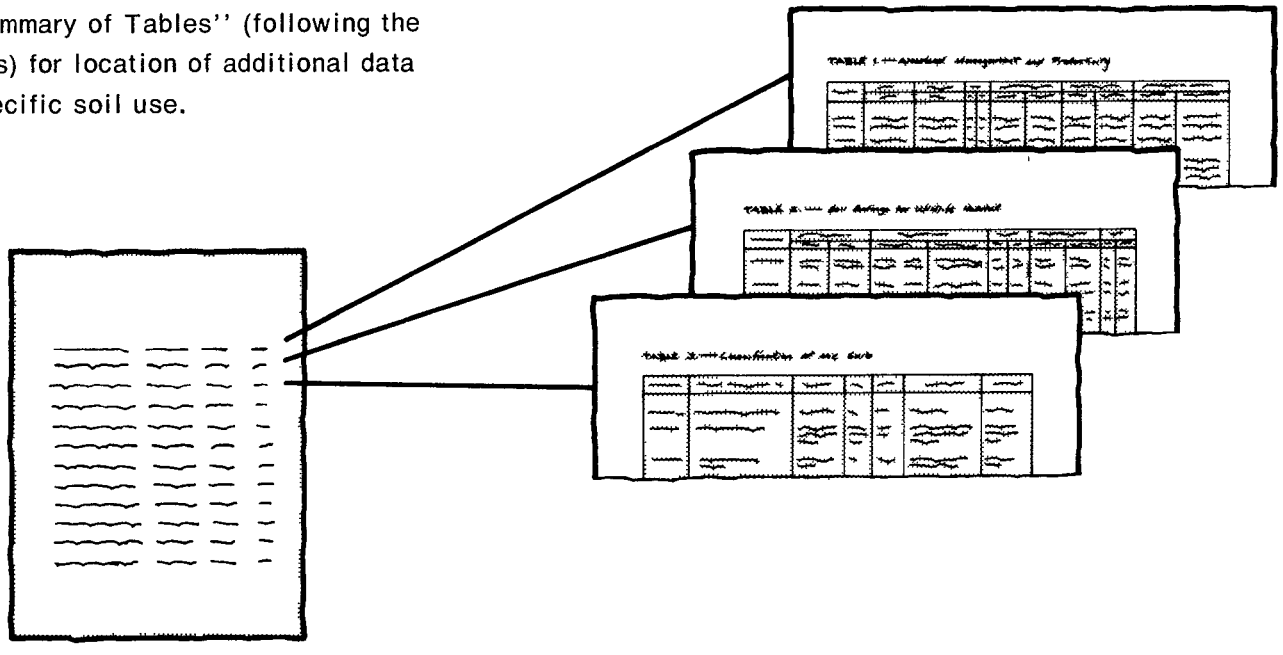
THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.





6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists, for planners, community decision makers, engineers, developers, builders, or homebuyers, for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1970-76. Soil names and descriptions were approved in 1977. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1977. This survey was made cooperatively by the Soil Conservation Service, the Bureau of Indian Affairs, and the University of California Agricultural Experiment Station. It is part of the technical assistance furnished to the Tulare County Resource Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Typical landscape and vegetation of the lower part of the Sierra Nevada foothills in Tulare County, on Friant soils.

contents

soil series

Issued February 1982

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summary of tables

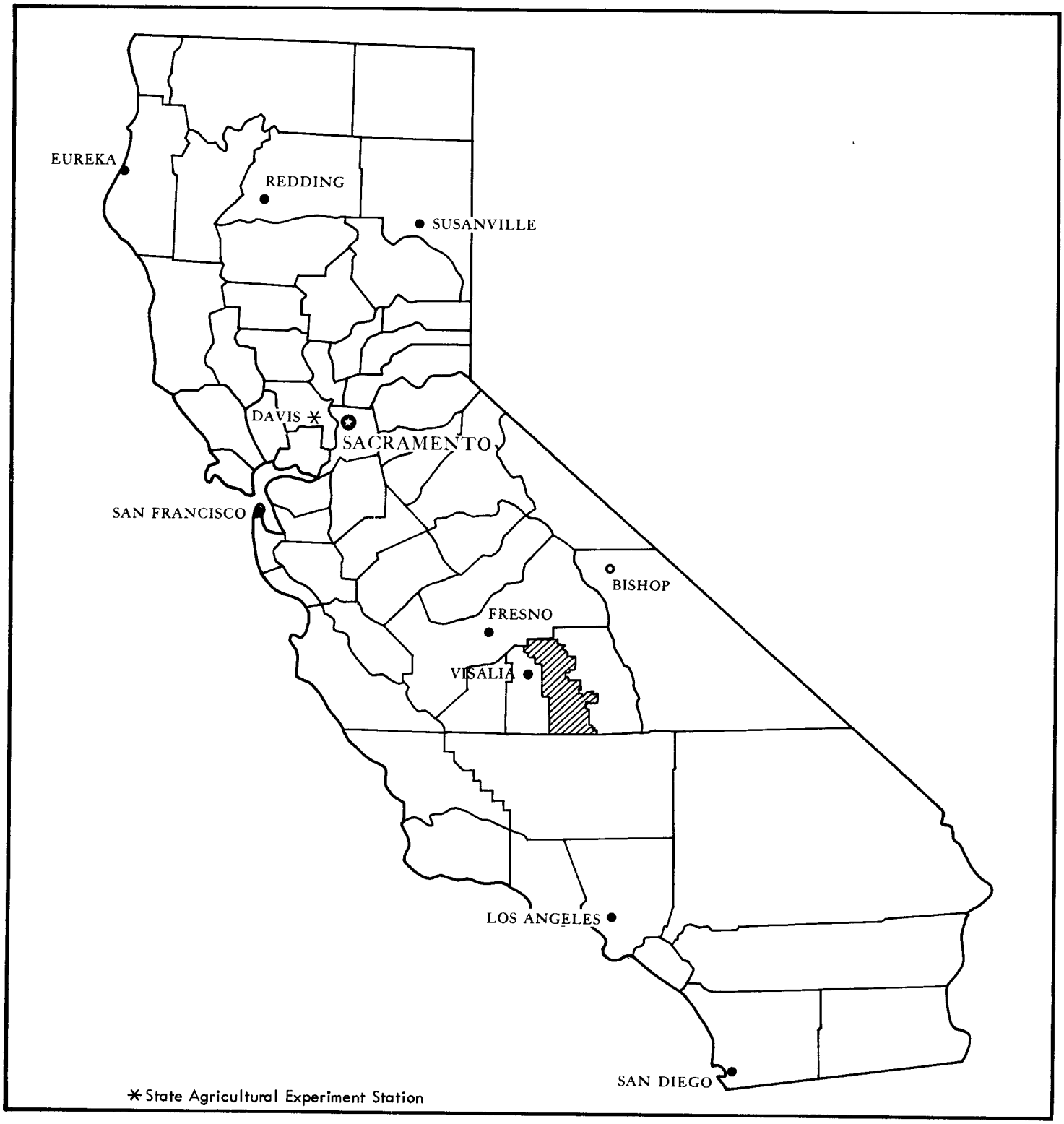
preface

This soil survey contains information that can be used in land-planning programs in Tulare County, California, Central Part. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.



Location of Tulare County, California, Central Part.

soil survey of
Tulare County, California, Central Part

By Floyd G. Stephens, Soil Conservation Service

Fieldwork by Floyd G. Stephens, Lucius W. Waterman, William D. Broderson, and Joseph J. Jahnke, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service, and United States Department of the Interior, Bureau of Indian Affairs, in cooperation with the University of California Agricultural Experiment Station

Tulare County, Central Part, covers an area of 815,360 acres, or about 1,274 square miles. It ranges from 20 to 22 miles wide, east to west, and is about 60 miles in length from north to south. The survey area is close to the geographic center of California. It is in the eastern part of the San Joaquin Valley and on the western slope of the Sierra Nevada. The soil survey area is bounded on the east by the Sequoia National Park and Sequoia National Forest; on the south by Kern County; on the north by Fresno County; and on the west the boundary line is near the towns of Terra Bella, Porterville, Lindsey, Exeter, Woodlake, Seville, and Orosi. The area is oriented in a slightly northwest-southeast direction.

Most of the soils in the central part of Tulare County are used for agriculture. A few areas are used for towns and related urbanization. Elevation ranges from about 200 feet in the San Joaquin Valley to about 7,600 feet in the upper foothills.

general nature of the survey area

This section provides general information about the central part of Tulare County. It discusses history and development; physiography, relief, and drainage; natural vegetation; water supply; farming; and climate.

history and development

Tribes of Yokut Indians and some 30 or more subtribes of Yokuts lived in the valley and lower foothills before settlers, explorers, and miners arrived. In the upper foothills were a tribe of Monos, related to the Piute tribes from the eastern side of the Sierra Nevada *(9)*. Campsites used by the Indians are still recognized by the dark surface of the midden areas, the scatterings of shells, chips of obsidian, and an occasional arrowhead.

Tulare County was formed in 1852 from the southern part of Mariposa County. At that time Tulare County covered land from Mariposa County to Los Angeles County. At later dates, parts of Fresno, Kings, Inyo, and Kern Counties were made out of the original Tulare County *(8)*. In 1853, Visalia became the county seat of Tulare County.

In 1805, Gabriel Moraga, one of the earliest known explorers, came to the area in search of sites for missions. He gave Spanish names to the rivers he crossed on his way through the valley. Today, we call these rivers the Kings, Kaweah, and Tule Rivers.

Jedediah Smith and his party were the first known trappers to come to the San Joaquin Valley in 1827. John C. Fremont, with Kit Carson as his guide, camped near the Kaweah River in 1844.

Settlement accelerated at the time of the gold rush in 1855. Mining continued in the county into the 1870's. After the gold rush many people turned to raising cattle. Before the railroads, residents of Tulare County were dependent on wagon and stage roads. The first Butterfield stage arrived in Visalia on October 8, 1858. After the railroads were extended, the county people engaged in farming, mostly dryland wheat. Later,

because of the low rainfall in the area, crudely built canals were constructed to obtain water from the Kaweah River, thus, irrigated farming developed.

According to the United States Bureau of Census, the population of Tulare County was 149,264 in 1950. By 1970, the population reached 188,322.

About 95 percent of the land in the survey area is in private ownership. The remaining acreage is city and county parks. National forest and national park lands in the county are excluded from the survey area; however, the Tule River Indian Reservation of about 56,000 acres is included.

Elementary and secondary schools serve all parts of the area. Two community colleges are in Tulare County. Porterville Community College is in the survey area, and the College of Sequoias is nearby in the city of Visalia.

Electricity and natural gas are supplied to nearly all parts of the survey area. Bottled gas is available in the more isolated parts of the survey area. Telephone service is supplied to most of the area, and television, shopping centers, and other modern conveniences are also available.

Recreation is readily available in the central part of Tulare County. Lakes and ponds provide fishing and water sports. Sequoia National Forest and Sequoia National Park are along the eastern border of the area. Several county and city parks are also available. Throughout the survey area, state highways and secondary roads connect smaller communities and help speed traffic to major centers Trucklines, airlines, buslines, and two railroads provide shipping facilities and transportation.

physiography relief, and drainage

The central part of Tulare County is partly in the San Joaquin Valley and partly in the foothills of the Sierra Nevada. (See figure 1 in "General soil map units.") The San Joaquin Valley forms the southern half of the Central Valley, which is enclosed on all sides by mountains, except where the Sacramento and San Joaquin Rivers enter the San Francisco Bay. The Sierra Nevada forms a barrier on the eastern side of the valley. The western slope of the Sierra Nevada has many deeply cut river canyons. The rivers are fed by many tributaries that are commonly separated by sharp crested interfluves or by broad, hilly to steep lands adjacent to the streams.

The Sierra Nevada foothills, in the eastern part of the survey area, range in elevation from about 400 feet at the edge of the valley to about 7,600 feet near Parker Peak, which is on the Tule River Indian Reservation in the southeastern part of the survey area. The general rock types in the area and the river systems that drain it have contributed to the varied, undulating to steep mountainous relief.

A number of streams and small drainageways flow into the valley rather than through it. In seasons of extreme rainfall, these streams and drainageways carry runoff into the Tulare Lake Basin to the southwest. The Kaweah River enters the valley through a canyon in the mountains east of Woodlake. Terminus Dam, constructed at the mouth of the canyon, impounds the waters of Lake Kaweah. The Tule River enters the valley through a canyon in the mountains east of Porterville. Success Dam impounds the waters of Lake Success.

A short distance below these dams, the Kaweah and Tule Rivers divide into a number of old stream channels. At McKays Point the Kaweah River divides and branches into the St. Johns River. Many of these old channels are now used during the early part of summer to convey irrigation water. Most of the surface waters of the Kaweah and Tule Rivers are diverted and used for irrigation, but a large quantity of water sinks into the sands of the delta to replenish the undergound reservoir and is later pumped to the surface for irrigation. At one time the water table in the delta of the Kaweah and Tule Rivers was very close to the surface. This favored the growth of water grasses, willows, and cottonwood trees, but extensive pumping for irrigation has lowered the water table to a considerable depth, except in local areas where ground water is recharged from nearby streams. Smaller streams are Cottonwood Creek, north of the town of Woodlake; Dry Creek, east of Woodlake; Sand Creek, north of the town of Orosi; Yokohl Creek, east of the town of Exeter; Lewis Creek, east of the town of Lindsay; Deer Creek, east of the town of Terra Bella; and White River, southeast of the town of Ducor. These streams extend into the valley from the lower foothills, but all soon dry up by seeping into the sandy creek beds.

The valley lands in the soil survey area are part of the alluvial plains on the east side of the San Joaquin Valley. The alluvial material that formed this nearly level to rolling landscape was derived entirely from runoff from the Sierra Nevada.

The alluvial fans adjacent to the Kaweah and Tule Rivers and the smaller, local streams are the most extensive of the landforms. They also formed from the deposition of alluvial material from the Sierra Nevada. Dominant slope of these areas is toward the west.

Terraces are extensive in the eastern part of the valley. They have nearly level to gently rolling slopes and are at a higher position on the landscape than the alluvial fans. They are locally known as hogwallow land, or hardpan land. Viewed from a distance, the relief in undisturbed areas appears fairly smooth, but closer observation brings out the hogwallow relief of low mounds and shallow depressions. The mounds range from 5 feet to 30 feet in diameter and from 2 feet to 4 feet in height. These areas are drained by channels, but water generally stands in the depressions for a considerable period following heavy rains. Outlets are lacking, and the hardpan prevents water from moving through the soil. One of the largest remaining areas of hogwallow land is in Yokohl Valley, south of the town of

Yokohl. Soils in these areas formed in alluvial deposits that were laid down at times of heavy runoff from the Sierra Nevada during or following the Pleistocene period. In an area south of the town of Ducor is a body of elevated terraces that do not have hardpans. These terraces are broken in places by hilly slopes.

natural vegetation

The valley soils are mostly cultivated and support a variety of crops under irrigation. Some natural vegetation remains on alluvial fans and terraces and in small unreclaimed areas of saline-alkali soils. In the foothills the vegetation ranges from annual grasses in open areas to dense shrubs and trees. During the dry season in summer and early fall, the hazard of fire in the foothills is serious. Lookout and control stations are maintained here during the fire season. Much of the native vegetation in the area has been replaced by introduced species or has been eliminated by cultivation and overgrazing.

The valley lands originally supported large herds of elk, antelope, and wild horses that grazed mainly on native grasses. Even as early as 1844, filaree, an introduced forb from the Mediterranean region, was noted in the stands *(7)*. Marshes in the valley supported large areas of bulrush or tule and cattail. Trees and shrubs grew along many of the streams and rivers, as they do today. These include cottonwood, willow, western sycamore, wild rose, California blackberry, and valley oak.

On the terraces the present vegetation consists mainly of red brome, soft chess, foxtail, and filaree. In places bur clover and wild oats grow on the finer-textured soils in years when the supply of moisture is favorable. Many forbs, including such wildflowers as California poppy, blue lupine, brodiaea, and buttercups, are conspicuous in spring.

The natural cover of the unreclaimed saline-alkali soils consists of poor stands of red brome, soft chess, and foxtail and plants that tolerate salts and alkali. Among the plants that tolerate salt and alkali are saltgrass, alkali-mallow, alkali barley, and alkali blite.

Weeds are a serious problem in many cultivated areas. Bermudagrass provides good forage in irrigated pasture and makes a durable lawn in this climate, but it is a serious pest in fields of row crops and in the vineyards. Other pests are starthistle, sandbur, Russian-thistle, mustard, and fiddleneck. Puncturevine is particularly troublesome in the sandy soils along shoulders of roads. Some of these weeds can be controlled by clean cultivation and introduced insects; others can be more effectively controlled by weed killers. Tule and cattail cause trouble along irrigation and drainage ditches.

In the foothills the vegetation ranges from open annual grasses at low elevations, where rainfall is fairly low, to trees and grasses or trees and shrubs at high elevations where rainfall is higher. The annual grasses are similar to those on the terraces that are not cultivated. Filaree and soft chess are dominant. Ripgut is common in places. Burclover and wild oats are abundant, particularly on the finer-textured soils.

The principal trees in the woodlands are blue oak, interior live oak, and California buckeye. In a few areas south of White River, digger pine is on steep slopes. The trees at higher elevations are canyon live oak, black oak, ponderosa and sugar pines, incense-cedar, and white fir. Giant sequoias are found mostly on the north-facing slopes in the Tule River Indian Reservation and at elevations above 5,000 feet. Cottonwood, sycamore, alder, and willow grow along many streams.

The shrub cover consists mainly of wedgeleaf and whitethorn ceanothus, Mariposa manzanita, mountainmahogany, poison-oak, California redbud, and California yerba-santa.

water supply

Water of generally good to excellent quality is available to the soil survey area from streams, rivers, reservoirs, springs, canals, and rainfall. The natural source is runoff or accumulation of rainfall and snowfall from the Sierra Nevada. Winter accumulation of snow in the higher mountains provides a seasonal reservoir of water. The water flows to the area mainly through the Kaweah, Kings, and Tule Rivers. These rivers supply much of the surface water used for irrigation and much of the ground water pumped for irrigation and for domestic and industrial use.

Water is diverted to the southern part of the San Joaquin Valley through the Friant-Kern Canal. This canal is along the eastern edge of the valley and is siphoned under the major rivers and larger streams. Water is diverted from the canal to irrigation districts. These irrigation districts distribute water to farmers in the central part of Tulare County.

The construction of Pine Flat, Success, and Terminus Dams, on the Kings, Tule, and Kaweah Rivers, has helped control flooding. The dams also help regulate the use of surface and ground water. This is necessary because much farming in the county is done by irrigating.

By pumping, the ground water reservoir supplies needed water during seasonal periods when surface water is low or during years of unfavorable precipitation. The ground water is replenished by infiltration of rainfall and tailwater from irrigated fields; by seepage from streams, unlined canals, ditches, and ponds; and by underground flow of streams through permeable material in canyons *(6)*. Increased development of irrigated cropland, increased population, and new industry may make it necessary to import additional water from the California water system.

In the foothills, water is obtained from perennially and seasonally intermittent streams, from springs, and from shallow wells in pockets of alluvium or deeply weathered rock. Earthen dams have been constructed in

drainageways throughout the foothills to intercept and impound water for livestock or for recreational use, and in a few places sufficient water is available to permit irrigated pasture.

farming

A highly specialized, intensive farming that uses a wide variety of crops has developed because of the combination of good soils, a plentiful supply of water for irrigation, and the long growing season.

Vegetable crops grown in the county include asparagus, beans, corn, cucumbers, melons, onions, peppers, potatoes, squash, and tomatoes. Nurseries in the county produce a wide variety of landscaping plants, trees for deciduous and citrus orchards, and grapevines.

Much of the income in the county comes from agricultural crops. Tulare County ranks as number one county in California for citrus acreage and production. Nearly 90,000 acres of the county's warm, eastern foothills are now planted to citrus trees. According to the Tulare County Farm Advisors, navel oranges (winter and spring harvest) are most popular, and 65 percent of the acreage is planted to this variety. Valencia oranges (summer and fall harvest) are next; 28 percent of the acreage is planted to this type. Lemons make up 5 percent of the acreage, and the remaining 2 percent is made up of grapefruit, tangerines, and various hybrids, such as tangelos. Fruit and nut crops are grown on older alluvial fans and recent alluvial fans along rivers and streams. These crops can also be grown on the older alluvial soils in which hardpans have developed; however, these hardpan soils must be ripped or altered to allow root penetration. In certain areas citrus crops are grown in the lower foothills where irrigation is possible. Field crops are intermingled with fruit and nut crops in places.

climate

The central part of Tulare County is shielded from the direct flow of wind from the Pacific Ocean. It is hot and dry in summer and cool and moist in winter. Brief, light freezes are fairly common, but they do not preclude growing many crops. Winter rains are interspersed with spells of cloudy or foggy weather or sunny weather. Snow occasionally accumulates at higher elevations in the foothills in the eastern part of the area. Summers are rainless, and crops growing actively need irrigation.

An important orange growing industry has been established in the valley west of the foothills because of the nearly frost-free winters in most years. Livestock grazing dominates the foothills because sufficient winter precipitation in most years produces good quality annual grasses and forbs.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Ash Mountain and Lindsay, California, for the period 1951 to 1976. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperatures at Ash Mountain and Lindsay are 48 and 47, respectively. The average daily minimum temperature is 37 degrees at Ash Mountain and 36 degrees at Lindsay. The lowest temperature occurred at Ash Mountain on December 9, 1972, and is 18 degrees. In summer the average temperature is 80 degrees at Ash Mountain and 79 degrees at Lindsay. The average daily maximum temperature is about 95. The highest recorded temperature, which occurred at Ash Mountain on June 22, 1961, is 114 degrees.

Growing degree days, shown in table 1, are equivalent to heat units. During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 25 inches at Ash Mountain and 11 inches at Lindsay. Of this, 20 percent usually falls in April through September, which includes the growing season for most crops. The heaviest 1-day rainfall during the period of record was 7.33 inches at Ash Mountain on December 6, 1966. Thunderstorms occur on about 5 days each year; most are in the spring.

Average seasonal snowfall is 2 inches at Ash Mountain but is only traces at Lindsay. The greatest depth of snow at any one time during the period of record was 4 inches at Ash Mountain. On the average, 1 day has at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 40 percent. Humidity is higher at night, and the average at dawn is about 65 percent. The percentage of possible sunshine is 95 in summer and 55 in winter. The prevailing wind is from the northwest. Average windspeed is highest, 7 miles per hour, in the summer.

Every few years excessive rainfall from persisting storms combines with unseasonal snowmelt to cause flooding.

Climatic data for this section were especially prepared for the soil conservation service by the National Climatic Center, Asheville, North Carolina.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent

material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils (fig. 1). The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general soil map at the back of this survey does not join, in all instances, with the general soil maps of adjacent survey areas. Differences in the maps have resulted from the differences in the soil patterns and the recent advances in classification. The map units in this survey area have been grouped into three physiographic regions: the San Joaquin Valley, the lower Sierra Nevada foothills, and the upper Sierra Nevada foothills. Each group and its map units are described on the pages that follow.

soil descriptions

soils of the San Joaquin Valley

The soils in this group are in the San Joaquin Valley from the western boundary of the soil survey area to the western edge of the Sierra Nevada foothills. The young alluvial fans consist of a sequence of narrow to broad areas of deposited soil washed from the Sierra Nevada by rivers and streams. The older landforms are terraces above the streams. These terraces were formed at an earlier time by alluvial deposits from the streams. Elevation ranges from 300 to 850 feet. The mean annual precipitation ranges from 9 to 12 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 225 to 300 days.

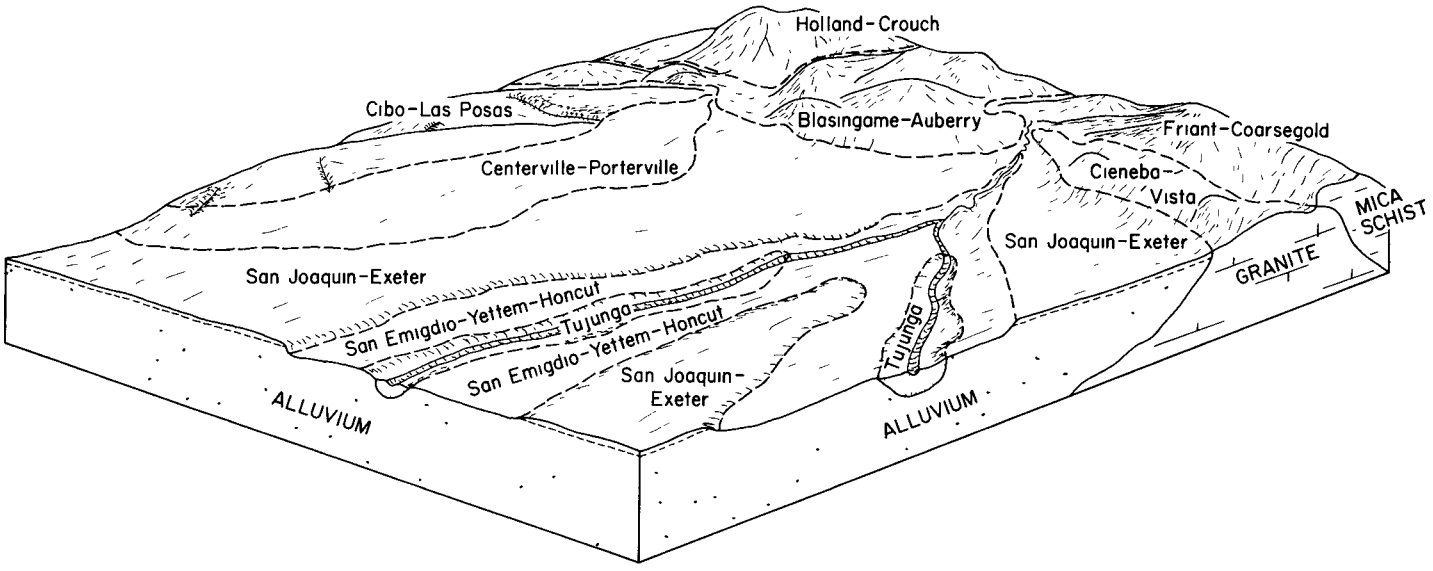


Figure 1—The general soil map units are located on the landscape in three major geographic areas: The San Joaquin Valley, the lower Sierra Nevada foothills, and the upper Sierra Nevada foothillls.

These soils are very deep and moderately deep, and they are well drained. The surface layer ranges from sandy loam to clay.

These soils are used mainly for orchards, vineyards, and cultivated crops, which are mainly grown on nearly level to gently sloping soils. Steeper soils and soils located where irrigation water is not available are used for dryland wheat or rangeland. In a few small areas the soils are used for urban development.

Three map units are in this group. They make up about 27 percent of the survey area.

1. San Emigdio-Yettem-Honcut

Very deep, nearly level to gently sloping, well drained loams and sandy loams; on alluvial fans

This map unit is on the eastern side of San Joaquin Valley, but it is in the western part of the survey area. Most San Emigdio soils are in an area near the town of Porterville and adjacent to the Tule River. Most Yettem soils are in an area north of the town of Orosi, south of the town of Seville, and near the town of Woodlake. The largest areas of Honcut soils are near the towns of Orosi and Lindsay. Soils in this map unit formed in medium-textured and moderately coarse textured alluvium, which was derived from weathered granitic and sedimentary rock.

This map unit makes up about 3 percent of the survey area. It is about 26 percent San Emigdio soils, 25 percent Yettem soils, and 22 percent Honcut soils. The remaining 27 percent is minor soils.

Typically, San Emigdio soils have a surface layer of moderately alkaline loam. The underlying material is moderately alkaline loam and fine sandy loam. Slope ranges from 0 to 2 percent.

Typically, Yettem soils have a surface layer of slightly acid sandy loam. The underlying material is neutral and mildly alkaline sandy loam. Slope ranges from 0 to 5 percent.

Typically, Honcut soils have a surface layer of slightly acid sandy loam. The underlying material is neutral and mildly alkaline sandy loam. Slope ranges from 0 to 5 percent.

Minor soils and the miscellaneous area in this map unit are Havala, Grangeville, Greenfield, Tujunga, and Wyman soils and Riverwash. The Havala, Greenfield, and Wyman soils are on older alluvial fans at higher positions in the landscape. The Grangeville soils are somewhat poorly drained and are adjacent to the main rivers and streams. Riverwash is a miscellaneous area of nearly barren riverbeds subject to frequent flooding during the rainy season. Tujunga soils are on recent alluvial fans and are somewhat excessively drained.

The major soils are used mainly for orchards, vineyards, and cultivated crops. The major crops grown are oranges, olives, plums, table grapes, and cotton. In a few areas these soils are used for rangeland and urban development.

The major soils in this map unit have few limitations for most crops commonly grown in the area. Soil erosion is the main problem on the soils that have 2 to 5 percent slopes.

The major soils have good potential for openland and rangeland habitat for wildlife. Soils that have slope of more than 3 percent are limited for wetland habitat. Native habitat and cropland provide food and cover for California quail, ring-necked pheasant, mourning dove, cottontail, and jackrabbit. Permanent vegetation left on or developed along banks of ditches and streams and in areas near cultivated land improves food and cover for wildlife.

2. San Joaquin-Exeter

Moderately deep, nearly level to gently rolling, well drained loams that have a hardpan; on terraces

This map unit is scattered throughout the eastern side of the San Joaquin Valley, which is in the western part of the survey area. Soils in this map unit formed in medium-textured and moderately fine textured alluvium, which was derived from weathered granitic rock.

This map unit makes up about 10 percent of the survey area. It is about 60 percent San Joaquin soils and 30 percent Exeter soils. The remaining 10 percent is minor soils.

Typically, San Joaquin soils have a surface layer of mildly alkaline loam and a subsoil of mildly alkaline sandy clay loam and moderately alkaline clay. Below the subsoil is a silica cemented hardpan. Slope ranges from 0 to 9 percent.

Typically, Exeter soils have a surface layer of neutral loam and a subsoil of mildly alkaline loam, sandy clay loam, and clay loam. Below the subsoil is a silica cemented hardpan. Below the hardpan is moderately alkaline sand and gravelly coarse sand. Slope ranges from 0 to 9 percent.

Minor soils in this map unit are Lewis and Wyman soils. The Lewis soils are moderately well drained and have moderate amounts of sodium in the subsoil. They are on terraces, but in most places they are at lower positions in the landscape. The Wyman soils are on alluvial fans that dissect the old terraces.

The major soils are used mainly for orchards, vineyards, and cultivated crops. The major crops grown are oranges, olives, plums, table grapes, and cotton. In a few areas the soils are used for rangeland and urban development.

The major soils in this map unit have a hardpan below the subsoil. The main problems of these soils for many uses are the low to moderate available water capacity, very slow to moderately slow permeability, and the hardpan below the subsoil. If the hardpan is ripped, the soils are suited to most crops grown in the area.

These soils have good potential for openland and rangeland habitat for wildlife. Soils that have slope of more than 3 percent are limited for wetland habitat.

Native habitat and cropland provide food and cover for California quail, ring-necked pheasant, mourning dove, cottontail, and jackrabbit. Permanent vegetation left on or developed along banks of ditches and streams and in areas near cultivated land improves food and cover for wildlife.

3. Centerville-Porterville

Moderately deep and very deep, nearly level to hilly, well drained clays; on dissected terraces and alluvial fans

This map unit is on the eastern side of the San Joaquin Valley, which is in the western part of the survey area. Most Centerville soils are in an area near the towns of Terra Bella, Ducor, and Fountain Springs. The Porterville soils are on alluvial fans in areas that are southeast of the towns of Cutler, Yettem, Lindsay, and Porterville. The alluvial fans are adjacent to the foothills and extend westward to the west boundary of the survey area. Soils in this map unit formed in fine-textured alluvium, which was derived from weathered granite and gabbro rock.

This map unit makes up about 14 percent of the survey area. It is about 50 percent Centerville soils and 35 percent Porterville soils. The remaining 15 percent is minor soils.

Centerville soils are moderately deep. Typically, they have a surface layer of moderately alkaline clay. The underlaying material is moderately alkaline clay and sandy clay. Below this is highly weathered, feldspathic sandy material. Slope ranges from 0 to 30 percent.

Porterville soils are very deep. Typically, they have a surface layer of neutral and mildly alkaline clay. The underlying material is mildly alkaline and moderately alkaline clay and sandy clay. Slope ranges from 0 to 15 percent.

Minor soils of this map unit are Havala, Clear Lake, Seville, and Wyman. Havala and Wyman soils are at lower positions in the landscape. The Clear Lake soils are poorly drained and are also at lower positions in the landscape. The Seville soils are nearly level and on terraces. They have a hardpan at a depth of 20 to 40 inches.

The major soils are used mainly for orchards and cultivated crops. The major crops grown are oranges, olives, almonds, plums, cotton, and nonirrigated wheat. Some steeper soils are used as rangeland. A few small areas are used for urban development.

The major soils in this map unit are suited to most crops grown in the area. When cultivated, the main problems of these soils are the fine texture and erosion on the steeper soils. In some areas of the Porterville soils, cobbles scattered on the surface are also a problem.

These soils have fair potential for openland and rangeland habitat for wildlife. Soils that have slopes of more than 3 percent are limited for wetland habitat. Native habitat and cropland provide food and cover for California quail, ring-necked pheasant, mourning dove, cottontail, and jackrabbit. Permanent vegetation left on or developed along banks of ditches and streams and in areas near cultivated lands improves food and cover for wildlife.

soils on the lower Sierra Nevada foothills

The soils in this group extend from the western edge of the Sierra Nevada foothills to elevations of about 3,500 feet. The elevation, shape, and aspect of the land surface affects the local climate and local formation of the soils, which, in turn, determines the eastern boundary. The soils in this group are warmer and drier than the soils in the upper Sierra Nevada foothills. Elevation ranges from 400 to 3,500 feet. The mean annual precipitation ranges from 12 to 20 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 150 to 300 days.

These shallow soils are moderately deep and deep, gently rolling to very steep, and somewhat excessively drained and well drained. The surface layer ranges from coarse sandy loam to clay.

These soils are used mainly as rangeland. The vegetation is an open cover or very open cover of annual grasses and forbs. Trees and shrubs are scattered on the landscape at the lower elevations and become more dense at the higher elevations especially on north- and east-facing slopes. Some soils are used as habitat for wildlife. The soils also have some recreational and esthetic value.

Four map units are in this group. They make up about 65 percent of the survey area.

4. Blasingame-Auberry

Moderately deep and deep, gently rolling to steep, well drained sandy loams

This map unit is scattered throughout the lower foothills of the survey area. It is on uneven side slopes. Some areas of low, irregularly shaped rock outcropping are in this map unit. Soils in this map unit formed in moderately coarse textured material weathered from granitic rock.

This map unit makes up about 32 percent of the survey area. It is about 45 percent Blasingame soils and 35 percent Auberry soils. The remaining 20 percent is minor soils.

Blasingame soils are moderately deep. Typically, they have a surface layer of slightly acid sandy loam and a subsoil of neutral loam, sandy clay loam, and clay loam. Below the subsoil is strongly weathered quartz diorite. Slope ranges from 9 to 50 percent.

Auberry soils are deep. Typically, they have a surface layer of slightly acid sandy loam and a subsoil of slightly acid and medium acid loam and sandy clay loam. Below the subsoil is strongly weathered quartz diorite. Slope ranges from 5 to 50 percent.

Minor soils and the miscellaneous land area in this map unit are Fallbrook, Sesame, Vista, and Walong soils and Rock outcrop. The Fallbrook soils are deeper to bedrock than the Blasingame soils, but they are similar in color and texture. The largest area of Fallbrook soils is north of the town of Springville and east of the town of Milo. Rock outcrop is a miscellaneous land area in which over 90 percent of the surface is exposed granite bedrock. Sesame soils have smooth slopes and have a brown surface layer and subsoil. Vista soils have moderately coarse textures in the surface layer and subsoil. Walong soils are on north-facing slopes and have moderately coarse texture in the surface layer and subsoil.

These major soils are used mainly as rangeland. Forage yields on rangeland are good in years of favorable moisture and poor in years of unfavorable moisture. Dense woody vegetation is the cover on some soils that are at higher elevations, especially on north- and east-facing slopes. In small areas oranges and avocados are grown where irrigation water is available and where the frost hazard is low. A few small areas of Blasingame soils are used for urban development.

The major soils in this map unit are well suited to moderately suited to rangeland. Soil erosion is the main problem on steeper soils. On a slope of 30 percent or more, livestock have limited access, so the less sloping soils are overgrazed. Erosion is the main problem if steeper sloping soils are used for orchards.

These soils have good to fair potential for openland and rangeland habitat for wildlife. Slope and Rock outcrop limit potential for wildlife habitat. Where slope is less than 30 percent, potential is good; where slope is 30 to 50 percent, potential is fair. In areas that are up to 25 percent Rock outcrop and where the soils have slope of 50 percent or more, potential is poor to very poor. Poorly rated soils should have onsite evaluation to determine their suitability for wildlife habitat.

Native habitat provides food and cover for ground squirrels and other rodents, which are prey for such predators as red-tailed hawk, coyote, and bobcat. Other wildlife common to native habitat includes band-tailed pigeon, mourning dove, wild turkey, California quail, meadowlark, brush rabbit, cottontail, and California mule deer. Planting and properly managing herbaceous plants, shrubs, and trees can improve wildlife habitat on soils that have slope of less than 30 percent. The steeper soils inhibit cultivation and planting of herbaceous plants. Wildlife habitat can best be improved on the steeper soils by managing native plants. These soils are very poorly suited to development of wetland habitat because of steep slopes and because they are well drained.

5. Cieneba-Vista

Shallow and moderately deep, rolling to very steep, somewhat excessively drained and well drained coarse sandy loams

This map unit is scattered throughout the lower foothills of the survey area. It is on narrow ridgetops and uneven, south-facing side slopes. Some areas of low, irregularly shaped rock outcropping are in this map unit. Soils in this map unit formed in moderately coarse textured material weathered from granitic rock.

This map unit makes up about 15 percent of the survey area. It is about 50 percent Cieneba soils and 35 percent Vista soils. The remaining 15 percent is minor soils.

Cieneba soils are shallow. Typically, they have a surface layer of medium acid coarse sandy loam. Below this is strongly weathered granitic rock. Slope ranges from 15 to 75 percent.

Vista soils are moderately deep. Typically, they have a surface layer of neutral coarse sandy loam and a subsoil of slightly acid coarse sandy loam. Below the subsoil is strongly weathered granitic rock. Slope ranges from 9 to 50 percent.

Minor soils and the miscellaneous land area in this map unit are Auberry, Blasingame, and Walong soils and Rock outcrop. Auberry soils are deeper than the Cieneba and Vista soils and have a moderately fine textured subsoil. Blasingame soils have a reddish brown, moderately fine textured subsoil. Rock outcrop is a miscellaneous land area in which over 90 percent of the surface is exposed granite bedrock. Walong soils have a higher organic matter content in the surface layer than the Cieneba or Vista soil have. Most of the Walong soils are northeast of Three Rivers and south of the Kaweah River. In some areas a dense woody vegetation is the cover at the higher elevations.

The major soils are used mainly as rangeland. In years of favorable moisture, forage yields are good on the Vista soils and fair on the Cieneba soils. In years of unfavorable moisture, forage yields are poor on the Cieneba and Vista soils. In small areas of the Vista soils, oranges and avocados are grown where irrigation water is available and where the frost hazard is low. A few small areas of Vista soils are used for urban development.

The Cieneba soils are poorly suited to rangeland. They are limited mainly by shallow depth to rock, coarse texture, and low available water capacity. Vista soils are well suited to moderately suited to rangeland. Soil erosion and overgrazing are the main limitations on the Vista soils. On slopes of less than 30 percent, soil erosion is the main limitation. Livestock have limited access to rangeland where slope is 30 percent or more, so the less sloping soils are overgrazed. Soil erosion is the main problem on the steeper soils if they are used for orchards.

Both of these soils have fair potential to very poor potential for openland and rangeland habitat for wildlife. Slope and Rock outcrop limit potential for wildlife habitat. Where slope is less than 30 percent, potential is fair; where slope is 30 to 50 percent, potential is poor. In areas that are up to 25 percent Rock outcrop and where

the soils have a slope of 50 percent or more, potential is very poor. Poorly rated soils should have onsite evaluation to determine suitability for development of wildlife habitat.

Native habitat provides food and cover for ground squirrels and other rodents, which are prey for such predators as red-tailed hawk, coyote, and bobcat. Other wildlife common to the native vegetation include band-tailed pigeon, mourning dove, wild turkey, California quail, meadowlark, brush rabbit, cottontail, and California mule deer. Planting and properly managing herbaceous plants, shrubs, and trees can improve wildlife habitat on soils that have slope of less than 30 percent. The steeper soils are unsuitable for cultivation and planting of herbaceous plants. Wildlife habitat can best be improved on the steeper soils by managing native plants. These soils are very poorly suited to wetland habitat because of steep slope and because they are well drained to somewhat excessively drained.

6. Friant-Coarsegold

Shallow and moderately deep, hilly to very steep, well drained fine sandy loams and loams

This map unit is scattered throughout the lower foothills of the survey area. It is on uneven side slopes. Some areas of low, angularly shaped rock outcropping is in this map unit. Soils in this map unit formed in moderately coarse textured and medium-textured material weathered from metasedimentary rock, mainly quartz mica schist.

This map unit makes up about 10 percent of the survey area. It is about 45 percent Friant soils and 45 percent Coarsegold soils. The remaining 10 percent is minor soils.

Friant soils are shallow. Typically, they have a surface layer of slightly acid fine sandy loam. The next layer is slightly acid gravelly fine sandy loam. This is underlain by hard, slightly weathered quartz mica schist. Slope ranges from 15 to 75 percent.

Coarsegold soils are moderately deep. Typically, they have a surface layer of slightly acid loam and a subsoil of slightly acid heavy loam, clay loam, and gravelly clay loam. Below the subsoil is weathered mica schist. Slope ranges from 15 to 50 percent.

Minor soils and the miscellaneous land area in this map unit are Blasingame, Las Posas, and Trabuco soils and Rock outcrop. Blasingame soils have a moderately coarse textured surface layer and formed from residuum of granitic rock. Las Posas soils have a dark red clayey subsoil and formed from residuum of gabbro rock. Rock outcrop is a miscellaneous land area in which over 90 percent of the surface is exposed quartz mica schist. Trabuco soils have a clayey subsoil and are formed in residuum of gabbro rock.

The major soils are used mainly as rangeland. In years of favorable moisture, forage yields are good to very good on the Coarsegold soils and fair on the Friant soils. In years of unfavorable moisture, forage yields are poor on the Friant and Coarsegold soils. Vegetation at the lower elevations and on south- and west-facing slopes is mainly annual grasses and forbs. Vegetative cover on the Coarsegold soils ranges from partly open rangeland to dense trees and shrubs on the north- and east-facing slopes and at the higher elevations.

The Friant soils are poorly suited to rangeland. They are limited mainly for this use by shallow depth to rock and low available water capacity. Coarsegold soils are well suited to moderately suited to rangeland. Soil erosion is the main problem if the slope is less than 30 percent. Livestock have limited access to grazing on slope of 30 percent or more, so the less sloping soils are overgrazed.

These soils have good potential to very poor potential for openland and rangeland habitat for wildlife. Slope and Rock outcrop limit potential for wildlife habitat. Where slope is less than 30 percent, potential is good; where slope is 30 to 50 percent, potential is fair. In areas that are up to 25 percent Rock outcrop and where soils have slope of 50 percent or more, potential is poor to very poor. Poorly rated soils should have onsite evaluation to determine suitability for wildlife habitat.

Native habitat on this map unit provides food and cover for ground squirrels and other rodents, which are prey for such predators as red-tailed hawk, coyote, and bobcat. Other wildlife common to the native vegetation include band-tailed pigeon, mourning dove, wild turkey, California quail, meadowlark, brush rabbit, cottontail, and California mule deer. Planting and properly managing herbaceous plants, shrubs, and trees can improve wildlife habitat on soils that have slope of less than 30 percent. The steeper soils are unsuitable for cultivation and planting of herbaceous plants. Wildlife habitat can best be improved on the steeper soils by managing native plants. These soils are very poorly suited to wetland habitat because of steep slope and because they are well drained.

7. Cibo-Las Posas

Moderately deep, rolling to steep, well drained clays and loams

This map unit is scattered throughout the lower foothills of the survey area. It is on smooth side slopes. Some areas of low, irregularly shaped rock outcropping are in this map unit. Soils in this map unit are formed in medium-textured to fine-textured material weathered from basic igneous rock, mainly gabbro.

This map unit makes up about 8 percent of the survey area. It is about 75 percent Cibo soils and 20 percent Las Posas soils. The remaining 5 percent is minor soils.

Typically, Cibo soils have a surface layer of neutral clay about 35 inches thick. Below the clay is hard fractured gabbro. Slope ranges from 15 to 50 percent. Deep, wide cracks form in this soil when it is dry.

Typically, Las Posas soils have a surface layer of slightly acid to neutral loam and a subsoil of neutral to

mildly alkaline clay and clay loam. Below the subsoil is weathered gabbro. Slope ranges from 9 to 50 percent.

Minor soils and the miscellaneous land area in this map unit are Trabuco soils and Rock outcrop. Rock outcrop is a miscellaneous land area in which over 90 percent of the surface is exposed gabbro rock. The Trabuco soils are deeper to bedrock than the Cibo soils are, and they have a subsoil that is not as red as that of the Las Posas soils. Trabuco soils have a more dense woody vegetation than the Cibo and Las Posas soils have. Trabuco soils receive more rainfall at the higher elevations.

The major soils are used mainly as rangeland. Forage yields on rangeland are very good in years of favorable moisture and poor in years of unfavorable moisture. A few small areas of Cibo soils are used for urban development.

The major soils in this map unit are well suited to moderately suited to rangeland. Where slope is less than 30 percent, the soils are well suited to rangeland; where slope is 30 percent or more, the soils are moderately suited. Steepness of slope and fine texture are the main problems. Livestock have limited access to steeper soils, so less sloping soils are overgrazed. Soils compact if they are grazed when wet.

These soils have fair potential to very poor potential for openland and rangeland habitat for wildlife. Slope and Rock outcrop limit potential for wildlife habitat. Where slope is less than 30 percent, potential is fair; where slope is 30 to 50 percent, potential is poor. In areas that are up to 25 percent Rock outcrop and where soils have slope of 50 percent or more, potential is very poor. Poorly rated soils should have onsite evaluation to determine suitability for wildlife habitat.

Native habitat on this map unit provides food and cover for ground squirrels and other rodents, which are prey for such predators as red-tailed hawk, coyote, and bobcat. Other wildlife common to this map unit includes band-tailed pigeon, mourning dove, wild turkey, California quail, meadowlark, brush rabbit, cottontail, and California mule deer. Planting and properly managing herbaceous plants, shrubs, and trees can readily be done to improve wildlife habitat where soils have slope of less than 30 percent. The steeper soils are unsuitable for cultivation and planting of herbaceous plants. Wildlife habitat can best be improved on the steeper soils by managing native plants. These soils are very poorly suited to wetland habitat because of steep slope and because they are well drained.

soils of the upper Sierra Nevada foothills

The soils in this group extend from the eastern boundary of the lower Sierra Nevada foothills group to the eastern boundary of the survey area. The western, or the lower boundary in elevation, is not sharply defined and its location is dependent upon the aspect of the slope or the protective influence of prominent outlying hills and ridges in the lower foothills. Soils typical of the upper foothills are on canyon slopes of both the Kaweah and Tule Rivers. The eastern boundary of the survey area is near the conifer forests. The soils in the upper foothills differ in some respect from those in the lower foothills because they formed under a cooler, more moist climate. Elevation ranges from 3,500 to 7,600 feet. The mean annual precipitation ranges from 20 to 40 inches, and the mean annual air temperature is about 55 degrees F. The average frost-free season ranges from 140 to 200 days.

These are very deep, deep, and shallow soils that are hilly to very steep and well drained and somewhat excessively drained. The surface layer is loam or coarse sandy loam.

These soils are used as rangeland, woodland, wildlife habitat, and recreation. The vegetation is mainly woodland grasses and shrubs.

One map unit is in this group. It makes up about 8 percent of the soil survey area.

8. Holland-Crouch-Sheephead

Very deep, deep, and shallow, hilly to very steep, well drained and somewhat excessively drained loams and coarse sandy loams

This map unit is in the eastern part of the survey area and is on canyon slopes of both the Kaweah and Tule Rivers. Some areas of low, irregularly shaped rock outcropping are in this map unit. Soils in this map unit formed in medium-textured and moderately coarse textured material weathered from granitic rock.

This map unit makes up about 8 percent of the survey area. It is about 45 percent Holland soils, 25 percent Crouch soils, and 20 percent Sheephead soils. The remaining 10 percent is minor soils.

Holland soils are very deep and well drained. Typically, they have a surface layer of medium acid and slightly acid loam and a subsoil of slightly acid and medium acid loam and clay loam. Below the subsoil is strongly weathered granitic rock. Slope ranges from 15 to 50 percent.

Crouch soils are deep and well drained. Typically, they have a surface layer of slightly acid and medium acid coarse sandy loam. The next layers are slightly acid coarse sandy loam and loamy sand. Below this is strongly weathered granitic rock. Slope ranges from 15 to 50 percent.

Sheephead soils are shallow and somewhat excessively drained. Typically, they have a surface layer of slightly acid coarse sandy loam. This is over strongly weathered granodiorite. Sheephead soils are on or near ridges. The slope ranges from 15 to 75 percent.

Minor soils and the miscellaneous land area in this map unit are Auberry, Coarsegold, Fallbrook, Friant soils and Rock outcrop. The Auberry and Fallbrook soils have a subsoil of loam and sandy clay loam. Coarsegold soils are moderately deep and Friant soils are shallow to

quartz mica schist. Rock outcrop is a miscellaneous land area in which over 90 percent of the surface is exposed granite bedrock.

The major soils are used mainly as rangeland and woodland. Forage yields on rangeland are fair in years of favorable moisture and poor in years of unfavorable moisture. Forage yields on this map unit are not as good as the yields on the lower foothills. The cool and moist climate of this map unit encourages growth of dense shrubs and trees, which compete with the rangeland grasses. These soils are good for recreational use and wildlife habitat.

The major soils in this map unit are well suited to poorly suited to rangeland and woodland. Rock outcrop scattered on the landscape is the main problem. On slope of less than 30 percent, soil erosion and dense brushy or woody vegetation are the main problems for grazing livestock. On slope of 30 percent or more, livestock have limited access so the less sloping soils are overgrazed. The Sheephead soils are poorly suited to rangeland and woodland. They are limited for these uses mainly by shallow depth to rock, coarse texture, and low available water capacity. The Holland and Crouch soils are moderately to well suited to woodland at the higher elevations. They are suited to livestock grazing at lower elevations.

These soils have good potential to very poor potential for openland and woodland habitat for wildlife. Slope and Rock outcrop limit potential for wildlife habitat. Where slope is less than 30 percent, potential is good; where slope is 30 to 50 percent, potential is fair. In areas that are up to 25 percent Rock outcrop and where soils have slope of 50 percent or more, potential is poor to very poor. Poorly rated soils should have onsite evaluation to determine suitability for wildlife habitat.

Native habitat on this map unit provides food and cover for gray squirrels, black bear, woodpeckers, wild turkey, cottontail, and California mule deer. Planting and properly managing herbaceous plants, shrubs, and trees can improve wildlife habitat on soils that have slope of less than 30 percent. The steeper soils are unsuitable for cultivation and planting of herbaceous plants. Wildlife habitat can best be improved on the steeper soils by managing native plants. These soils are very poorly suited to wetland habitat because of excessive slope and because they are well drained and excessively drained.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses. At the end of each description, the capability classification; the land resource area, in parenthesis; and the Storie Index are given. See "Use and management of the soils" for more information on these classifications.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Auberry sandy loam, 5 to 9 percent slopes, is one of several phases in the Auberry series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of one major soil and a miscellaneous area in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Blasingame-Rock outcrop complex, 9 to 50 percent slopes, is an example.

Most map units include small scattered areas of soils or miscellaneous areas other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils and areas are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

100—Auberry sandy loam, 5 to 9 percent slopes. This deep soil is well drained and gently rolling. It is on uneven side slopes in the lower Sierra Nevada foothills. It is mainly on north- and east-facing slopes. It formed in residual material weathered from quartz diorite. Areas of this map unit are irregular in shape and range from about 20 to 200 acres in size. In many areas the soils are dissected by drainageways. The vegetation is annual grasses, forbs, shrubs, and hardwood trees. The shrubs and hardwood trees become more dense on north-facing slopes and at higher elevations. Elevation ranges from 400 feet to 3,500 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 150 to 260 days.

Typically, the surface layer is grayish brown and brown sandy loam about 16 inches thick. The subsoil is yellowish brown loam, brown sandy clay loam, and light yellowish brown loam and sandy loam about 40 inches thick. Below the subsoil is strongly weathered quartz diorite.

Included with this soil in mapping are a few small areas of Blasingame sandy loam, Cieneba coarse sandy loam, Vista coarse sandy loam and Rock outcrop. Also included are a few small areas of a soil that has a subsoil of sandy clay or clay and a few areas of an Auberry soil that has slope of more than 9 percent

These included soils make up about 20 percent of the mapped acreage.

This Auberry soil has moderately slow permeability and moderate to high available water capacity. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 40 to 60 inches.

This soil is used as rangeland and is suited to this use. It has few limitations when used for grazing. Woody plants at the higher elevations and on north-facing slopes are a problem in some places. If this soil is cleared of woody plants to create open areas, it produces a good stand of desirable grasses and forbs. The soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is moderately suited to building sites and roads and streets. The moderately high clay content in the subsoil can cause foundations or streets and roads to fail. This can be overcome by replacing the base material. The moderately slow permeability in the subsoil is a problem for septic tank absorption fields. This problem can be corrected by increasing the size of the absorption field. Leach lines of the septic tank system should be installed on the contour.

This soil is in capability unit IIIe-1 (18), irrigated, and IVe-1 (18), nonirrigated. It has a Storie Index of 61.

101—Auberry sandy loam, 9 to 15 percent slopes. This deep soil is well drained and rolling. It is on uneven side slopes in the lower Sierra Nevada foothills. It is mainly on north- and east-facing slopes. It formed in residual material weathered from quartz diorite. Areas of this map unit are irregular in shape and range from about 20 to 200 acres in size. In many areas the soils are dissected by drainageways. The vegetation is annual grasses, forbs, shrubs, and hardwood trees. The shrubs and hardwood trees become more dense on north-facing slopes and at higher elevations. Elevation ranges from 400 feet to 3,500 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 150 to 260 days.

Typically, the surface layer is grayish brown and brown sandy loam about 16 inches thick. The subsoil is yellowish brown loam, brown sandy clay loam and light yellowish brown loam and sandy loam about 40 inches thick. Below the subsoil is strongly weathered quartz diorite.

Included with this soil in mapping are a few small areas of Blasingame sandy loam, Cieneba coarse sandy loam, Coarsegold loam, Fallbrook sandy loam, Vista coarse sandy loam, and Rock outcrop. Also included are a few small areas of a soil that has a subsoil of sandy clay or clay and a few areas of Auberry soil that has slope of more than 15 percent. These included soils make up about 20 percent of the mapped acreage.

This Auberry soil has moderately slow permeability and moderate to high available water capacity. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 40 to 60 inches.

This soil is used as rangeland and is suited to this use. It has few limitations when used for grazing. Woody plants at the higher elevations and on north-facing slopes are sometimes a problem. If this soil is cleared of woody plants to create open areas, it produces a good stand of desirable grasses and forbs. The soil responds well to fertilizer and seeding of the rangeland. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is moderately suited to building sites and roads and streets. The steepness of slope and the moderately high clay content in the subsoil are the main problems. Steep banks should be stabilized to prevent erosion. Topsoil can be stockpiled and used to reclaim areas disturbed by cutting and filling. The moderately high clay content in the subsoil can cause roads and foundations to fail. This can be corrected by replacing the base material. Roads and streets built on the contour help to control runoff. The moderately slow permeability in the subsoil is a problem for septic tank absorption fields. This can be corrected by increasing the size of the absorption field. Leach lines of the septic tank system should be installed on the contour.

This soil is in capability unit IVe-1 (18), irrigated and nonirrigated, and has a Storie Index of 57.

102—Auberry sandy loam, 15 to 30 percent slopes. This deep soil is well drained and hilly. It is on uneven side slopes in the lower Sierra Nevada foothills. It is mainly on north- and east-facing slopes. It formed in residual material weathered from quartz diorite. Areas of this map unit are irregular in shape and range from about 50 to 500 acres in size. In many areas the soils are dissected by drainageways. The vegetation is annual grasses, forbs, shrubs, and hardwood trees. The shrubs and hardwood trees become more dense on north-facing slopes and at higher elevations. Elevation ranges from 400 feet to 3,500 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 150 to 260 days.

Typically, the surface layer is grayish brown and brown sandy loam about 16 inches thick. The subsoil is yellowish brown loam, brown sandy clay loam, and light yellowish brown loam and sandy loam about 40 inches thick. Below the subsoil is strongly weathered quartz diorite.

Included with this soil in mapping are a few small areas of Blasingame sandy loam, Cieneba coarse sandy loam, Coarsegold loam, Fallbrook sandy loam, Holland loam, and Rock outcrop. The few small areas of Holland loam are at elevations of above 3,000 feet. Also included are a few small areas of a soil that has a subsoil of sandy clay or clay and a few areas of Auberry soil that has slope of more than 30 percent. These included soils make up about 20 percent of the mapped acreage.

This Auberry soil has moderately slow permeability and moderate to high available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 40 to 60 inches.

This soil is used as rangeland and is suited to this use The hazard of erosion is the main problem. Erosion can be controlled by leaving adequate residue on the surface. Woody plants at the higher elevations and on north-facing slopes are a problem sometimes. If this soil is cleared of woody plants to create open areas, it produces a good stand of desirable grasses and forbs. This soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is poorly suited to urban development. Steepness of slope is the main problem for building sites, roads and streets, and septic tank absorption fields. Onsite investigations may indicate small isolated areas that are more suitable for homesites.

This soil is in capability subclass VIe (18), nonirrigated. It has a Storie Index of 44.

103—Auberry sandy loam, 30 to 50 percent slopes. This deep soil is well drained and steep. It is on uneven side slopes in the lower Sierra Nevada foothills. It is mainly on north- and east-facing slopes. It formed in residual material weathered from quartz diorite. There is some Rock outcrop. Areas of this map unit are irregular in shape and range from about 50 to 2,000 acres in size In many areas this soil is dissected by drainageways. The vegetation is annual grasses, forbs, shrubs, and hardwood trees. The shrubs and hardwood trees become more dense on north-facing slopes and at higher elevations. Elevation ranges from 400 feet to 3,500 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 150 to 260 days.

Typically, the surface layer is grayish brown and brown sandy loam about 16 inches thick. The subsoil is yellowish brown loam, brown sandy clay loam, and light yellowish brown loam and sandy loam about 40 inches thick. Below the subsoil is strongly weathered quartz diorite.

Included with this soil in mapping are a few small areas of Blasingame sandy loam, Cieneba coarse sandy loam, Coarsegold loam, Fallbrook sandy loam, Holland loam, and Vista coarse sandy loam. The few small areas of Holland loam are at elevations above 3,000 feet. Also included are a few small areas of a soil that has a subsoil of sandy clay or clay and a few areas of Auberry soil that has slope of more than 50 percent. These included soils make up about 20 percent of the mapped acreage.

This Auberry soil has moderately slow permeability and moderate to high available water capacity. Surface runoff is rapid and the hazard of erosion is high. The effective rooting depth is 40 to 60 inches.

This soil is used as rangeland and is suited to this use. It is limited for this use mainly by steepness of slope. Because steepness of slope limits access by livestock, the less sloping soils are overgrazed. Trails or walkways are needed to encourage livestock to graze on the steeper slopes. Woody plants at the higher elevations and on north-facing slopes are sometimes a problem. If this soil is cleared of woody plants to create open areas, it produces a good stand of desirable grasses and forbs. Soft chess, wild oats, burclover, and filaree are the key forage plants.

The potential for urban development is poor. Steepness of slope is the main problem for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIe (18), nonirrigated, and has a Storie Index of 27.

104—Auberry-Rock outcrop complex, 9 to 50 percent slopes. This rolling to steep soil and Rock outcrop are on uneven side slopes in the lower Sierra Nevada foothills. This complex is mainly on north- and east-facing slopes. Areas of this map unit are irregular in shape and range from about 50 to 2,000 acres in size. In many areas the soil is dissected by drainageways. The vegetation is annual grasses, forbs, shrubs, and hardwood trees. The shrubs and hardwood trees become more dense on north-facing slopes and at higher elevations. Elevation ranges from 400 feet to 3,500 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 150 to 260 days.

This complex is about 50 percent Auberry soil and about 25 percent Rock outcrop.

Included in mapping are a few small areas of Blasingame sandy loam, Cieneba coarse sandy loam, Coarsegold loam, Holland loam, Sesame sandy loam, and Vista coarse sandy loam. Also included are a few small areas of a soil that has a subsoil of a sandy clay or clay and a few areas of Auberry soil that has slope of more than 50 percent. These included soils make up 25 percent of the mapped acreage.

The Auberry soil is deep and well drained. It formed in residual material weathered from quartz diorite.

Typically, the surface layer is grayish brown and brown sandy loam about 16 inches thick. The subsoil is yellowish brown loam, brown sandy clay loam, and light yellowish brown loam and sandy loam about 40 inches thick. Below the subsoil is strongly weathered quartz diorite.

This Auberry soil has moderately slow permeability and moderate to high available water capacity. Surface runoff is medium or rapid, and the hazard of erosion is moderate or high. The effective rooting depth is 40 to 60 inches.

Rock outcrop consists of exposures of hard quartz diorite. These areas range from 3 to 500 feet in diameter

to 10 acres. Rock outcrop is impermeable, so vegetative growth is limited to fractures in the rock structure. Surface runoff is very rapid. There is no hazard of erosion.

This complex is used as rangeland and is suited to this use. It is limited for rangeland mainly by Rock outcrop and steepness of slope. Uniform grazing is hindered by Rock outcrop and the steeper slopes. Plant cover on the Auberry soil can deteriorate if overgrazed or mismanaged. Proper stocking rates should be maintained to obtain maximum production of vegetation. Woody plants at the higher elevations and on north-facing slopes are a problem in some places. If this Auberry soil is cleared of woody plants to create open areas, it produces a stand of desirable grasses and forbs. Soft chess, wild oats, burclover, and filaree are the main forage plants.

This complex is poorly suited for urban development. Steepness of slope and Rock outcrop are the main limiting features for building sites, roads and streets, and septic tank absorption fields. Onsite investigation may indicate isolated areas that are more suitable for homesites.

This soil is in capability subclass VIIs (18), nonirrigated, and has a Storie Index of 20.

105—Blasingame sandy loam, 9 to 15 percent slopes. This moderately deep soil is well drained and rolling. It is on uneven side slopes in the lower Sierra Nevada foothills. It formed in residual material weathered from quartz diorite. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 10 to 200 acres in size. In many areas the soil is dissected by drainageways. The vegetation is annual grasses, forbs, and a few shrubs and hardwood trees. Elevation ranges from 500 feet to 3,500 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 150 to 280 days.

Typically, the surface layer is brown sandy loam about 7 inches thick. The subsoil is reddish brown loam, sandy clay loam, and clay loam about 29 inches thick. Below the subsoil is strongly weathered quartz diorite.

Included with this soil in mapping are a few small areas of Auberry sandy loam, Cieneba coarse sandy loam, Coarsegold loam, Fallbrook sandy loam, Sesame sandy loam, and Vista coarse sandy loam. The Cieneba soil is mainly on ridgetops. Also included are a few small areas of a soil that has a subsoil of reddish brown clay. Near the Tule River and the town of Springville, a soil of 5 to 9 percent slope has a clay subsoil and cobbles and stones in the surface layer and subsoil. This soil has boulders on 5 to 10 percent of the surface. There are also a few areas of Blasingame soil that has slope of more than 15 percent. These included soils make up about 20 percent of the mapped acreage.

This Blasingame soil has moderately slow permeability and low to moderate available water capacity. Surface runoff is medium and the hazard of erosion is moderate. The effective rooting depth is 20 to 40 inches.

This soil is used mainly as rangeland. It is used for orchards in a few areas at lower elevations, where irrigation water is available and the frost hazard is low. Oranges and avocados are the main crops.

This soil is suited to rangeland. It has few limitations when used for grazing. It responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is moderately suited to orchards. The hazard of erosion on steep slopes and limited soil depth are the main problems when this soil is used for orchards. Minimum tillage and use of cover crops help maintain fertility and water intake rate and help reduce erosion. A system for collecting and disposing of excess water from higher lying soils may be necessary to prevent severe erosion damage. Sprinkler or drip irrigation is most suitable for orchards because of slope. The use of sprinkler or drip irrigation helps prevent soil erosion.

This soil is moderately suited to building sites and roads and streets. The steepness of slope and moderately high clay content in the subsoil are the main problems. Steep banks should be stabilized to prevent erosion. When cutting and filling, top soil can be stockpiled and used to reclaim areas. The moderately high clay content in the subsoil can cause foundations or roads to fail. This can be corrected by replacing the base material. Roads and streets built on the contour help control runoff. The main problems for septic tank absorption fields are limited depth of soil and moderately slow permeability in the subsoil. Seepage from the absorption field may come to the surface in lower lying areas. Community sewer systems may be needed if the density of houses becomes too great.

This soil is in capability unit IVe-8 (18), irrigated and nonirrigated, and has a Storie Index of 50.

106—Blasingame sandy loam, 15 to 30 percent slopes. This moderately deep soil is well drained and hilly. It is on uneven side slopes in the lower Sierra Nevada foothills. It formed in residual material weathered from quartz diorite. There is some outcropping of rock. Areas are irregular in shape and range from about 20 to 600 acres in size. In many areas the soil is dissected by drainageways. The vegetation is annual grasses, forbs, and a few shrubs and hardwood trees. Elevation ranges from 500 feet to 3,500 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average annual frost-free season ranges from 150 to 280 days.

Typically, the surface layer is brown sandy loam about 7 inches thick. The subsoil is reddish brown loam, sandy clay loam, and clay loam about 29 inches thick. Below the subsoil is strongly weathered quartz diorite.

Included with this soil in mapping are a few small areas of Auberry sandy loam, Cieneba coarse sandy loam, Fallbrook sandy loam, and Vista coarse sandy

loam. Also included are a few small areas of a soil that has a subsoil of reddish brown clay and a soil which has 5 to 10 percent of the surface covered by boulders and which has a subsoil of dark red clay. This latter soil is west of the Tule River, near the town of Milo. Another included soil is deep to weathered quartz diorite and has a medium acid subsoil. This soil is north of the town of Orosi, near the north boundary of the soil survey area. Also included are a few areas of a Blasingame soil that has slope of more than 30 percent. These included soils make up about 20 percent of the mapped acreage.

This Blasingame soil has moderately slow permeability and low to moderate available water capacity. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 20 to 40 inches.

This soil is used mainly as rangeland. In a few areas at the lower elevations, this soil is used for orchards because irrigation water is available and frost hazard is low. Oranges and avacados are the main crops. In a few small areas the soil is used for urban development.

This soil is suited to rangeland. The hazard of erosion is the main problem. Erosion can be controlled by leaving adequate residue on the surface. The soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is moderately suited to orchards. The hazard of erosion on steep slopes is the main problem when the soil is used for orchards. Minimum tillage and use of cover crops help maintain fertility and water intake rate and help reduce erosion. A system for collecting and dispersing excess water from higher lying soils may be necessary to prevent severe erosion damage. Drip irrigation is the most suitable for orchards because of slope. The use of drip irrigation prevents soil erosion caused by irrigation.

The potential for urban development is poor Steepness of slope and depth of soil to bedrock are the main problems for building sites, roads and streets, and septic tank absorption fields. Onsite investigations may indicate small isolated areas that are better suited to homesites.

This soil is in capability unit VIe-8 (18), irrigated, and capability subclass VIe (18), nonirrigated. It has a Storie Index of 38.

107—Blasingame sandy loam, 30 to 50 percent slopes. This moderately deep soil is well drained and steep. It is on uneven side slopes in the lower Sierra Nevada foothills. It formed in residual material weathered from quartz diorite. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 20 to 1,000 acres in size. Many areas of the soil are dissected by drainageways. The vegetation is annual grasses, forbs, and a few shrubs and hardwood trees. Elevation ranges from 500 feet to 3,500 feet The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 150 to 280 days.

Typically, the surface layer is brown sandy loam about 7 inches thick. The subsoil is reddish brown loam, sandy clay loam, and clay loam about 29 inches thick. Below the subsoil is strongly weathered quartz diorite.

Included with this soil in mapping are small areas of Auberry sandy loam, Cieneba coarse sandy loam, Fallbrook sandy loam, and Vista coarse sandy loam. Also included are a few small areas of soil that has a subsoil of reddish brown clay and a few areas of Blasingame soil where slope is more than 50 percent. These included soils make up about 20 percent of the mapped acreage.

This Blasingame soil has moderately slow permeability and low to moderate available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 20 to 40 inches.

This soil is used as rangeland and is suited to this purpose. It is limited for this use mainly by the steepness of slope. Because steepness of slope limits access by livestock, the less sloping soils are overgrazed. Trails or walkways are needed to encourage livestock to graze on the steeper slopes. Soft chess, wild oats, burclover, and filaree are the main forage plants.

The potential for urban development is poor. Steepness of slope and depth of soil to bedrock are the main problems for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIe (18), nonirrigated, and has a Storie Index of 23.

108—Blasingame-Rock outcrop complex, 9 to 50 percent slopes. This rolling to steep soil and Rock outcrop are on uneven side slopes in the lower Sierra Nevada foothills. Areas of this map unit are irregular in shape and range from about 20 to 1,500 acres in size. In many areas the soil is dissected by drainageways. The vegetation is annual grasses and forbs and a few shrubs and hardwood trees. Elevation ranges from 500 feet to 3,500 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 150 to 280 days.

This complex is about 50 percent Blasingame soil and about 25 percent Rock outcrop.

Included in mapping are a few small areas of Auberry sandy loam, Cieneba coarse sandy loam, and Vista coarse sandy loam. Also included are a few small areas of a soil that has a subsoil of reddish brown clay. Another included soil has boulders on 5 to 10 percent of the surface and a subsoil of dark red clay. This soil is west of the Tule River, near the town of Milo. There is an included soil that is deep to weathered quartz diorite and has a medium acid subsoil. This soil is north of the town of Orosi, near the north boundary of the survey area. Also included are a few small areas of Blasingame soil where slope is more than 50 percent. These included soils make up 25 percent of the mapped acreage.

The Blasingame soil is moderately deep and well drained. It formed in residual material weathered from quartz diorite.

Typically, the surface layer is brown sandy loam about 7 inches thick. The subsoil is reddish brown loam, sandy clay loam, and clay loam about 29 inches thick. Below the subsoil is strongly weathered quartz diorite.

The Blasingame soil has moderately slow permeability and low to moderate available water capacity. Surface runoff is medium or rapid, and the hazard of erosion is moderate or high. The effective rooting depth is 20 to 40 inches.

Rock outcrop consists of exposures of hard quartz diorite. These areas range from 2 to 300 feet in diameter to 10 acres. Rock outcrop is impermeable, so vegetative growth is limited to fractures in the rock structure. Surface runoff is very rapid, and there is no hazard of erosion.

This complex is used for rangeland and is suited to this use. It is limited for this use mainly by Rock outcrop and steepness of slope, which hinder uniform grazing. Plant cover on the Blasingame soil can easily deteriorate if overgrazed or mismanaged. Proper stocking rates should be maintained to obtain maximum production of vegetation. Soft chess, wild oats, burclover, and filaree are the main forage plants.

The potential for urban development is poor. Steepness of slope, depth of soil to bedrock, and the Rock outcrop are the main limiting features for building sites, roads and streets, and septic tank absorption fields. Onsite investigation may indicate small isolated areas where slopes are more gentle and are more suitable for homesites.

This soil is in capability subclass VIIs (18), nonirrigated. It has a Storie Index of 17.

109—Centerville clay, 0 to 2 percent slopes. This moderately deep soil is well drained and nearly level. It is on alluvial fans and dissected terraces. It formed in alluvium derived from weathered granitic sources. Slopes are smooth and simple. Most of this soil is south of the town of Porterville, and southeast of the town of Ducor. Areas of this map unit are irregular in shape and range from about 10 to 300 acres in size. The vegetation is annual grasses and forbs. Elevation ranges from 300 feet to 850 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 250 to 300 days.

Typically, the surface layer is dark grayish brown clay about 18 inches thick. The next layers are brown and reddish brown clay and sandy clay about 19 inches thick. Below this is a brown, highly weathered, feldspathic sandy material. In a few areas the surface layer is heavy clay loam. Deep, wide cracks form in this soil when it is dry.

Included with this soil in mapping are a few small areas of Exeter loam, Porterville clay, and San Joaquin loam. These included soils make up about 15 percent of the mapped acreage.

This Centerville soil has slow permeability and low to moderate available water capacity. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 20 to 40 inches.

Most areas of this soil are used for orchards and cultivated crops. Oranges, almonds, olives, and cotton are the main crops.

This soil is suited to orchards and cultivated crops. The clay texture of the subsoil and the depth limit this soil for orchards and cultivated crops. The rooting depth is limited for some crops. Cultivation is difficult if the soil is too dry or too wet. Proper tillage and maintaining crop residue on or near the surface help maintain soil tilth, fertility, and water infiltration. Chiseling or subsoiling into the underlying material may allow roots to grow deeper. Sprinkler and furrow irrigation are most suitable for orchards. Irrigation water should be controlled to avoid saturating the soil, which may damage trees. Furrow irrigation is most suitable for cultivated crops.

This soil is poorly suited to building sites, roads and streets, and septic tank absorption fields. This soil has high clay content and slow permeability and cannot support heavy loads. The problems for building sites and roads and streets can be overcome by replacing the base material. A severe problem for septic tank absorption fields is the slow permeability of this soil. Onsite evaluation is needed to determine the best method of sewage disposal.

This soil is in capability unit IIIs-5 (17), irrigated, and IVs-5 (17), nonirrigated. It has a Storie Index of 40.

110—Centerville clay, 2 to 9 percent slopes. This moderately deep soil is well drained and undulating to gently rolling. It is on alluvial fans and dissected terraces. It formed in alluvium derived from weathered granitic sources. Slopes are uneven and complex. Most of this soil is in an area south of the town of Porterville and southeast of the town of Ducor. Areas of this map unit are irregular in shape and range from about 20 to 3,000 acres in size. In a few areas this soil is dissected by shallow drainageways. The vegetation is annual grasses and forbs. Elevation ranges from 300 feet to 850 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 250 to 300 days.

Typically, the surface layer is dark grayish brown clay about 18 inches thick. The next layers are brown and reddish brown clay and sandy clay about 19 inches thick. Below this is a brown highly weathered feldspathic sandy material. In a few areas the surface layer is heavy clay loam. Deep, wide cracks form in this soil when it is dry.

Included with this soil in mapping are a few small areas of Exeter loam, Porterville clay, and San Joaquin loam. Also included are a few small areas of Centerville soil that has slope of more than 9 percent. These

included soils make up about 20 percent of the mapped acreage.

This Centerville soil has slow permeability and low to moderate available water capacity. Surface runoff is slow or medium, and the hazard of erosion is slight or moderate. The effective rooting depth is 20 to 40 inches.

Most areas of this soil are used for orchards and cultivated crops. Oranges, almonds, olives, and nonirrigated wheat are the main crops. A few areas are used as rangeland and for urban development.

This soil is suited to orchards and cultivated crops. The hazard of erosion on the steeper slopes, the clay texture, and the depth limit this soil for use as orchards and cultivated crops. Erosion can be controlled by farming across the slope and maintaining crop residue on or near the surface, especially during periods of rainfall. Nonirrigated wheatfields should be in fallow and should be minimum tilled for a year after each crop to prevent erosion, conserve moisture, and control weeds.

Orchards can be protected from erosion by maintaining all crop residue on or near the surface and by using cover crops. A system for collecting excess water and conducting it in diversions or permanent grassed waterways to outlets may be necessary. Cultivation is difficult if the soil is too dry or too wet. The soil should be tilled when moisture content is somewhat below field capacity, but it should not be air dry. Returning crop residue to the soil helps maintain soil tilth, water infiltration, and prevent erosion. Chiseling and subsoiling allow roots to grow deeper. Traffic on the soil during wet periods should be avoided to prevent soil compaction. Sprinkler and drip irrigation are most suitable for orchards. Irrigation water should be controlled to prevent erosion and saturation of the soil, which may damage the trees.

This soil is suited to rangeland. Soil compaction is the main problem. Compaction is less if the soil is grazed when the moisture content is less than field capacity. This soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is poorly suited to building sites, roads and streets, and septic tank absorption fields. This soil has high clay content and slow permeability and cannot support heavy loads. These problems can be overcome for building sites and roads and streets by replacing the base material. The slow permeability of this soil is a severe problem for septic tank absorption fields. Onsite evaluation is needed to determine the best method of sewage disposal.

This soil is in capability unit IIIe-5 (17), irrigated, and IVe-5 (17), nonirrigated. It has a Storie Index of 38.

111—Centerville clay, 9 to 15 percent slopes. This moderately deep soil is well drained and rolling. It is on alluvial fans and dissected terraces. It formed in alluvium derived from weathered granitic sources. Slopes are uneven and complex. Most of this soil is in an area south of the town of Porterville and southeast of the town of Ducor. Areas of this map unit are irregular in shape and range from about 20 to 2,500 acres in size. In a few areas this soil is dissected by shallow drainageways. The vegetation is annual grasses and forbs. Elevation ranges from 300 feet to 850 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 250 to 300 days.

Typically, the surface layer is dark grayish brown clay about 18 inches thick. The next layers are brown and reddish brown clay and sandy clay about 19 inches thick. Below this is a brown, highly weathered feldspathic material. In a few areas the surface layer is heavy clay loam. Deep, wide cracks form in this soil when it is dry.

Included with this soil in mapping are a few small areas of Porterville clay. Also included are a few small areas of Centerville soil that has slope of more than 15 percent. These included soils make up about 15 percent of the mapped acreage.

This Centerville soil has slow permeability and low to moderate available water capacity. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 20 to 40 inches.

Most areas of this soil are used for orchards and cultivated crops. Oranges, almonds, olives, and nonirrigated wheat are the main crops. A few areas are used as rangeland.

This soil is suited to orchards and cultivated crops. It is limited for this use by the hazard of erosion, steep slopes, clay texture, and depth. Erosion can be controlled by farming across the slope and maintaining crop residue on or near the surface, especially during periods of rainfall. Nonirrigated wheat fields should be in fallow and should be minimum tilled for one year after each crop to prevent erosion, conserve moisture, and control weeds.

Orchards can be protected from erosion by maintaining all crop residue on or near the surface and by cover crops. A system including diversions, erosion control structures, and permanent grassed waterways to collect excess water may be necessary. Cultivation is difficult if the soil is too dry or too wet. The soil should be tilled when moisture content is somewhat below field capacity, but it should not be air dry. Returning crop residue to the soil also helps maintain soil tilth and water infiltration and prevent erosion. Chiseling and subsoiling allow roots to grow deeper. Traffic on the soil during wet periods should be avoided to prevent soil compaction. Sprinkler and drip irrigation are most suitable for orchards. Irrigation water should be controlled to prevent erosion and saturation of the soil, which may damage the trees.

This soil is suited to rangeland. The hazard of erosion and soil compaction are the main problems. Erosion can be controlled by leaving adequate residue on the surface. Compaction is less if this soil is grazed when the moisture content is less than field capacity This soil

responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is poorly suited to building sites, roads and streets, and septic tank absorption fields. This soil has high clay content and slow permeability and cannot bear heavy loads. These problems for building sites and roads and streets can be overcome by replacing the base material. The slow permeability of this soil is a severe problem for septic tank absorption fields. Onsite evaluation is needed to determine the best method of sewage disposal.

This soil is in capability unit IVe-5 (17), irrigated and nonirrigated. It has a Storie Index of 36.

112—Centerville clay, 15 to 30 percent slopes. This moderately deep soil is well drained and hilly. It is on alluvial fans and dissected terraces. It formed in alluvium derived from weathered granitic sources. Slopes are uneven and complex. Most of this soil is in an area south of the town of Porterville and east of the town of Ducor. Areas of this map unit are irregular in shape and range from about 20 to 2,000 acres in size. In many areas the soil is dissected by drainageways. The vegetation is annual grasses and forbs. Elevation ranges from 300 feet to 850 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 250 to 300 days.

Typically, the surface layer is dark grayish brown clay about 18 inches thick. The next layers are brown and reddish brown clay and sandy clay about 19 inches thick. Below this is a brown, highly weathered feldspathic sandy material. In a few areas the surface layer is heavy clay loam. Deep, wide cracks form in this soil when it is dry.

Included with this soil in mapping are a few small areas of Centerville soil that has slope of more than 30 percent. This included soil makes up about 15 percent of the mapped acreage.

The Centerville soil has slow permeability and low to moderate available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 20 to 40 inches.

Most areas of this soil are used as rangeland. A few areas are used for orchards. Almonds are the main crop.

This soil is suited to rangeland. The hazard of erosion and soil compaction are the main problems. Erosion can be controlled by leaving adequate residue on the surface. Compaction is less if soil is grazed when the moisture content is less than field capacity. This soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is suited to orchards. The hazard of erosion on steep slopes, clay texture, and depth of soil are the main limitations. If the soil is used for orchards, a system of diversions and permanent grassed waterways is necessary to collect excess water during periods of high rainfall. Orchards can be protected from erosion by farming across the slope and by maintaining crop residue on or near the surface and a permanent cover crop. Cultivation is difficult if the soil is too dry or too wet. The soil should be tilled when moisture content is somewhat below field capacity, but it should not be air dry. Proper tillage and returning crop residue to the soil help maintain soil tilth and water infiltration and prevent erosion. Chiseling and subsoiling before planting trees allows roots to grow deeper. Traffic on the soil during wet periods should be avoided to prevent soil compaction. Drip irrigation is most suitable for orchards. Irrigation water should be controlled to prevent erosion and saturation of the soil, which may damage trees.

This soil is poorly suited to building sites, roads and streets, and septic tank absorption fields. The soil has high clay content and slow permeability, cannot support heavy loads, and has steep slopes. These problems can be overcome for building sites and roads and streets by replacing the base material. Severe problems for septic tank absorption fields are the slow permeability and steep slopes. Onsite evaluation is needed to determine the method of disposal.

The soil is in capability unit VIe-5 (17), irrigated, and capability subclass VIe (17), nonirrigated. It has a Storie Index of 28.

113—Cibo clay, 15 to 30 percent slopes. This moderately deep soil is well drained and strongly sloping. It is on even side slopes in the lower Sierra Nevada foothills. It formed in residual material derived from gabbro. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 20 to 2,000 acres in size. In many areas this soil is dissected by drainageways. The vegetation is annual grasses and forbs. Elevation ranges from 400 feet to 2,800 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 160 to 280 days.

Typically, the surface layer is brown clay about 19 inches thick. The next layer is reddish brown clay about 16 inches thick. Below this is light brownish gray and grayish brown, hard fractured gabbro. In a few areas the surface layer is clay loam. Deep, wide cracks form in this soil when it is dry.

Included with this soil in mapping are a few small areas of Coarsegold loam and Las Posas loam. Also included are small areas of a soil that has a surface layer of light brownish gray and grayish brown, calcareous clay loam and a subsoil of calcareous clay and clay loam. This soil is east of the town of Terra Bella and about 1 mile north of Fountain Springs. There are a few areas of Cibo soil that has slope of more than 30 percent. These included soils make up about 20 percent of the mapped acreage.

This Cibo soil has slow permeability and low to moderate available water capacity. Surface runoff is

rapid, and the hazard of erosion is high. The effective rooting depth is 20 to 40 inches.

This soil is used mainly as rangeland. A few small areas are used for urban development.

This soil is suited to rangeland. The hazard of erosion and soil compaction are the main problems. Erosion can be controlled by leaving adequate residue on the surface. Compaction is less if this soil is grazed when the moisture content is less than field capacity. This soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is poorly suited to urban development. Steepness of slope, limited depth of soil to bedrock, and high clay content are the main problems. This soil has a tendency to creep downslope when it is saturated with water.

This soil is in capability subclass VIe (18), nonirrigated, and has a Storie Index of 23.

114—Cibo clay, 30 to 50 percent slopes. This moderately deep soil is well drained and steep. It is on even side slopes in the lower Sierra Nevada foothills. It formed in residual material derived from gabbro. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 20 to 2,000 acres in size. In many areas this soil is dissected by drainageways. The vegetation is annual grasses and forbs. Elevation ranges from 400 feet to 2,800 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 160 to 280 days.

Typically, the surface layer is brown clay about 19 inches thick. The next layer is reddish brown clay about 16 inches thick. Below this is light brownish gray and grayish brown, hard fractured gabbro. In a few areas the surface layer is heavy clay loam. Deep, wide cracks form in this soil when it is dry.

Included with this soil in mapping are a few small areas of Coarsegold loam, Las Posas loam, and Trabuco loam. Also included are small areas of a soil that has a surface layer of light brownish gray and grayish brown, calcareous clay loam and a subsoil of calcareous clay and clay loam. The soil is east of the town of Terra Bella and about 1 mile north of Fountain Springs. A few areas of Cibo soil that has slope of more than 50 percent are included. These included soils make up about 20 percent of the mapped acreage.

This Cibo soil has slow permeability and low to moderate available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 20 to 40 inches.

This soil is used as rangeland and is suited to this use. It is limited mainly by the steepness of slope and soil compaction. Because steepness of slope limits access by livestock, the less sloping soils are overgrazed. Trails or walkways are needed to encourage livestock to graze on the steeper slopes. Compaction is less if this soil is grazed when the moisture content is less than field capacity. Soft chess, wild oats, burclover, and filaree are the main forage plants.

The potential for urban development is poor. Steep slopes, depth of soil to bedrock, and high clay content are the main problems. This soil has a tendency to creep downslope when it is saturated with water.

This soil is in capability subclass VIIe (18), nonirrigated, and has a Storie Index of 14.

115—Cibo-Rock outcrop complex, 15 to 50 percent slopes. This strongly sloping to steep soil and Rock outcrop are on even side slopes in the lower Sierra Nevada foothills. Areas of this complex are irregular in shape and range from about 20 to 2,000 acres in size. In many areas this soil is dissected by drainageways. The vegetation is annual grasses and forbs. Elevation ranges from 400 feet to 2,800 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 160 to 280 days.

This complex is about 50 percent Cibo soil and about 25 percent Rock outcrop.

Included in mapping are a few small areas of Centerville clay, Coarsegold loam, Las Posas loam, and Trabuco loam. Also included are small areas of a soil that has a subsoil of light brownish gray and grayish brown, calcareous clay and heavy clay loam. This soil is in an area east of the town of Terra Bella and about 1 mile north of Fountain Springs. A few areas of Cibo soil that has slope of more than 50 percent are also included. These included soils make up 25 percent of the mapped acreage.

Cibo soil is moderately deep and well drained. It formed in residual material derived from gabbro.

Typically, the surface layer is brown clay about 19 inches thick. The next layer is reddish brown clay about 16 inches thick. Below this is light brownish gray and grayish brown, hard fractured gabbro. In a few small areas the surface layer is heavy clay loam. Deep, wide cracks form in this soil when it is dry.

This Cibo soil has slow permeability and low to moderate available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 20 to 40 inches.

Rock outcrop consists of exposures of hard gabbro. These areas range from 4 to 500 feet in diameter to 10 acres. Rock outcrop is impermeable, so vegetative growth is limited to fractures in the rock structure. Surface runoff is very rapid, and there is no hazard of erosion.

This complex is used as rangeland and is suited to this use. The soil is limited for this use mainly by Rock outcrop, steepness of slope, and compaction. Uniform grazing is hindered by Rock outcrop and steep slope. Compaction on this Cibo soil is less if it is grazed when the moisture content is less than field capacity. Plant cover can easily deteriorate if overgrazed or

mismanaged. Proper stocking rates should be maintained to obtain optimum production of vegetation. Soft chess, wild oats, burclover, and filaree are the dominant forage plants.

This unit is poorly suited to urban development. Steepness of slope, Rock outcrop, depth to bedrock, and high clay content are the main limiting features for building sites, roads and streets, and septic tank absorption fields. The soil has a tendency to creep or slide downslope when it is saturated with water. It should have onsite evaluation to determine urban uses.

This soil is in capability subclass VIIs (18), nonirrigated, and has a Storie Index of 9.

116—Cieneba-Rock outcrop complex, 15 to 75 percent slopes. This hilly to very steep soil and Rock outcrop are on ridgetops and uneven side slopes. This complex is mainly on south-facing slopes in the lower Sierra Nevada foothills (fig. 2). Areas of this complex are irregular in shape and range from about 20 to 2,000 acres in size. In many areas the soil is dissected by drainageways. The vegetation is annual grasses, forbs, and scattered shrubs and hardwood trees. Elevation ranges from 500 feet to 3,500 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 200 to 280 days.

This complex is about 55 percent Cieneba soil and about 25 percent Rock outcrop.

Included in mapping are a few small areas of Blasingame sandy loam, Vista coarse sandy loam, and Walong sandy loam. Also included are a few small areas of a soil that is on north exposures and has a dark

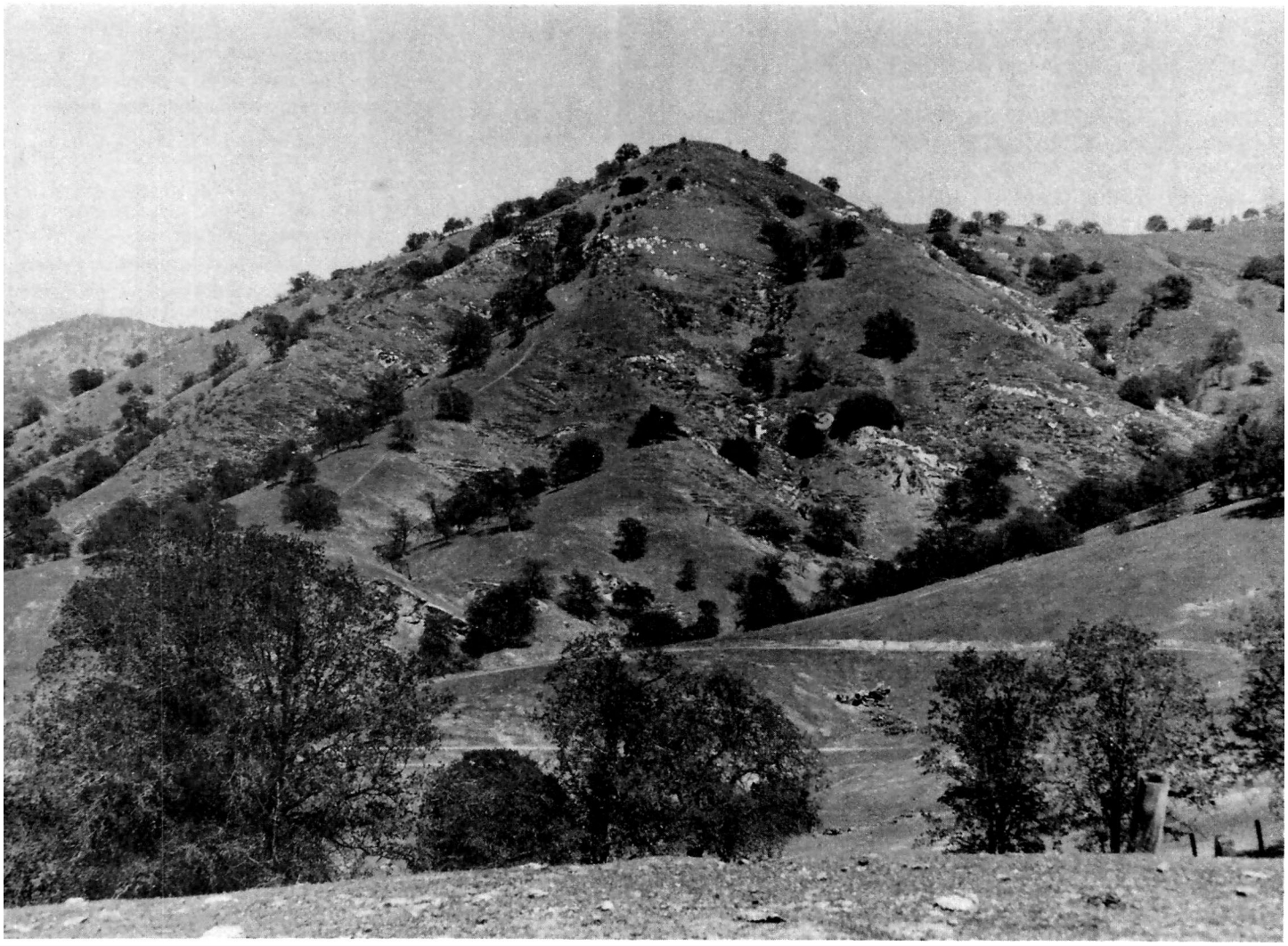


Figure 2.—Typical landscape and native vegetation of the Cieneba soils

colored surface layer. These included soils make up about 20 percent of the mapped acreage.

The Cieneba soil is shallow and somewhat excessively drained. It formed in residual material weathered from granitic rock.

Typically, the surface layer is light brownish gray coarse sandy loam about 16 inches thick. Below this is strongly weathered granitic rock.

This Cieneba soil has moderately rapid permeability and very low available water capacity. Surface runoff is rapid or very rapid, and the hazard of erosion is high or very high. The effective rooting depth is 10 to 20 inches.

Rock outcrop consists of exposures of hard granitic rock. These areas range from 2 to 300 feet in diameter to 10 acres. Rock outcrop is impermeable, so vegetative growth is limited to fractures in the rock structure. Surface runoff is very rapid, and there is no hazard of erosion.

This complex is used as rangeland; however, it is poorly suited for this use. The Cieneba soil is limited for this use mainly by shallow depth to bedrock and moderately coarse texture, which results in limited rooting depth and very low available water capacity. Plant cover can easily deteriorate if overgrazed or mismanaged. Deterioration of plant cover can result in extensive erosion. Uniform grazing is hindered by Rock outcrop and steep slope. Proper stocking rates should be maintained to obtain optimum production of vegetation. Soft chess, wild oats, and filaree are the main forage plants.

This complex is poorly suited to urban development. Steepness of slope, Rock outcrop, and shallow depth to bedrock are the main limiting features for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIs (18), nonirrigated, and has a Storie Index of 7.

117—Clear Lake clay, drained. This very deep soil is poorly drained. It is on alluvial fans and basins and in swales of drainageways. It formed in alluvium, mainly from weathered granitic sources. Slopes are smooth and simple. Slope ranges from 0 to 2 percent. Areas of this map unit are irregular in shape and range from about 10 to 200 acres in size. In a few areas this soil is dissected by shallow drainageways. The vegetation is annual grasses, forbs, and a few cattails and sedges. Elevation ranges from 200 feet to 1,500 feet. The mean annual precipitation is about 12 inches, and the mean annual air temperature is about 62 degrees F. The average frost-free season ranges from 225 to 300 days.

Typically, the surface layer is dark gray clay about 24 inches thick The underlying material is gray clay to a depth of 66 inches. The soil has common, grayish brown mottles at a depth of 24 to 36 inches. The soil is calcareous below 24 inches. Deep, wide cracks form in this soil when it is dry.

Included with this soil in mapping are a few small areas of Centerville clay, Grangeville silt loam, Havala loam, and Porterville clay. Also included are a few small areas of Clear Lake soil that has slope of more than 2 percent. These included soils make up about 15 percent of the mapped acreage.

This Clear Lake soil has slow permeability and high available water capacity. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more. Pumping ground water has lowered the water table to a depth of more than 6 feet. Flow of nearby streams is controlled to the extent that most areas of this soil are rarely flooded.

Most areas of this soil are used as rangeland. A few areas are used for orchards and irrigated pasture. Oranges, olives, and plums are the main crops. Expected yields from irrigated pasture are about 12 animal units per month.

This soil is suited to rangeland. Soil compaction is the main problem. Compaction is less if the soil is grazed when the moisture content is less than field capacity. This soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is suited to orchards. The clay texture is the main limitation of this soil. To prevent soil compaction, traffic on this soil should be avoided during wet periods. Orchards can be protected from erosion by maintaining all crop residue on or near the surface and by using cover crops. Returning crop residue to the soil also helps maintain soil tilth, fertility, and water infiltration. Sprinkler and furrow irrigation are most suitable for orchards. Irrigation water should be controlled to avoid saturating the soil, which may damage orchards.

This soil is well suited to irrigated pasture. Soil compaction is the main problem. Grazing when the moisture content is less than field capacity helps prevent soil compaction. Sprinklers are most suitable for irrigated pasture because the water enters the fine-textured soil slowly. Occasional mowing or clipping the grass helps maintain uniform growth, discourages selective grazing, and reduces clumping.

This soil is poorly suited to building sites, roads and streets, and septic tank absorption fields. It has high clay content and slow permeability and cannot bear heavy loads. Under abnormal conditions, flooding is a severe problem in low lying areas. Shrinking and swelling and low strength caused by the high clay content can cause problems for building sites and roads and streets. This can be corrected by replacing the base material. A severe problem for septic tank absorption fields is the slow permeability of this soil. Onsite evaluation is needed to determine the correct method of sewage disposal.

This soil is in capability unit IIs-5 (17), irrigated, and IVs-5 (17), nonirrigated. It has a Storie Index of 36.

118—Coarsegold loam, 15 to 30 percent slopes. This moderately deep soil is well drained and hilly. It is on uneven side slopes in the Sierra Nevada foothills. It formed in residual material derived from mica schist. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 20 to 300 acres in size. In many areas this soil is dissected by drainageways. The vegetation is annual grasses, forbs, and a few shrubs and hardwood trees. Elevation ranges from 500 feet to 3,500 feet. The mean annual precipitation is about 20 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 160 to 260 days.

Typically, the surface layer is brown loam about 7 inches thick. The subsoil is reddish brown loam, clay loam, and gravelly clay loam about 24 inches thick. Below the subsoil is weathered mica schist. In a few areas the surface layer is sandy loam or fine sandy loam.

Included with this soil in mapping are a few areas of Auberry sandy loam, Blasingame sandy loam, Friant fine sandy loam, Las Posas loam, and Trabuco loam. Also included are small areas of a soil that has a subsoil of brown clay loam and a few areas of Coarsegold soil that has slope of more than 30 percent. These included soils make up about 20 percent of the mapped acreage.

This Coarsegold soil has moderately slow permeability and low to moderate available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 20 to 40 inches.

This soil is used as rangeland and is suited to this use. The hazard of erosion is the main problem. Erosion can be controlled by leaving adequate residue on the surface. The soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is poorly suited to urban development. The main problems for building sites, roads and streets, and septic tank absorption fields are steepness of slope and depth of soil. Onsite investigation may indicate small isolated areas that are suitable for homesites.

This soil is in capability subclass VIe (18), nonirrigated, and has a Storie Index of 36.

119—Coarsegold loam, 30 to 50 percent slopes. This moderately deep soil is well drained and steep. It is on uneven side slopes in the Sierra Nevada foothills (fig. 3). It formed in residual material derived from mica schist. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 20 to 1,000 acres in size. In many areas this soil is dissected by drainageways. The vegetation is annual grasses, forbs, and a few shrubs and hardwood trees. Elevation ranges from 500 feet to 3,500 feet. The mean annual precipitation is about 20 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 160 to 260 days.

Typically, the surface layer is brown loam about 7 inches thick. The subsoil is reddish brown loam, clay loam, and gravelly clay loam about 24 inches thick. Below the subsoil is weathered mica schist. In a few areas the surface layer is sandy loam or fine sandy loam.

Included with this soil in mapping are a few areas of Auberry sandy loam, Blasingame sandy loam, Friant fine sandy loam, Las Posas loam, and Trabuco loam. Also included are small areas of a soil that has a subsoil of brown clay loam and a few areas of Coarsegold soil that has slope of more than 50 percent. These included soils make up about 20 percent of the mapped acreage.

This Coarsegold soil has moderately slow permeability and low to moderate available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 20 to 40 inches.

This soil is used as rangeland and is suited to this use. It is limited mainly by the steepness of slope. Because steepness of slope limits access by livestock, the less sloping soils are overgrazed. Trails and walkways are needed to encourage livestock to graze on the steeper slopes. Soft chess, wild oats, burclover, and filaree are the main forage plants.

This soil is poorly suited to urban development. Steepness of slope and limited depth to bedrock are the main problems for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIe (18), nonirrigated, and has a Storie Index of 22.

120—Coarsegold-Rock outcrop complex, 15 to 50 percent slopes. This hilly to steeply sloping soil and Rock outcrop are on uneven side slopes in the lower Sierra Nevada foothills. Areas of this map unit are irregular in shape and range from about 20 to 1,000 acres in size. In many areas this soil is dissected by drainageways. The vegetation is annual grasses, forbs, and a few scattered shrubs and hardwood trees. Elevation ranges from 500 feet to 3,500 feet. The mean annual precipitation is about 20 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 160 to 260 days.

This complex is about 50 percent Coarsegold soil and about 30 percent Rock outcrop.

Included in mapping are a few small areas of Auberry sandy loam, Blasingame sandy loam, Friant fine sandy loam, Las Posas loam, and Trabuco loam. Small areas of Coarsegold soil, on the Tule River Indian Reservation, are at a higher elevation than 3,500 feet. A few areas of Coarsegold soil that has slope of more than 50 percent are also included. These included soils make up 20 percent of the mapped acreage.

The Coarsegold soil is moderately deep and well drained. It formed in residual material derived from mica schist.

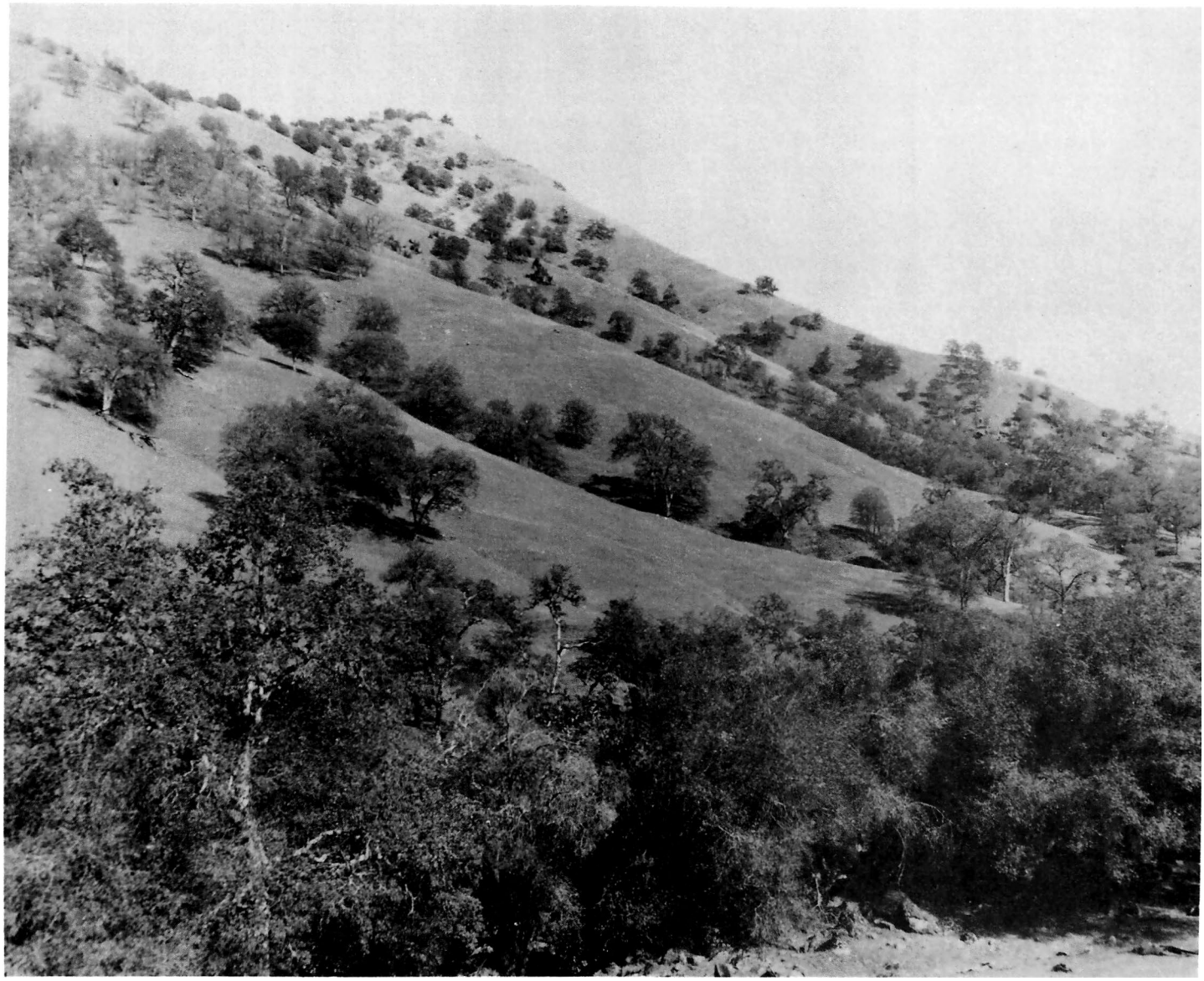


Figure 3—Typical landscape and native vegetation of the Coarsegold soils

Typically, the surface layer is brown loam about 7 inches thick. The subsoil is reddish brown loam, clay loam, and gravelly clay loam about 24 inches thick. Below the subsoil is weathered mica schist. In a few areas the surface layer is sandy loam or fine sandy loam.

This Coarsegold soil has moderately slow permeability and low to moderate available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 20 to 40 inches.

Rock outcrop is mica schist. These areas range from 4 to 200 feet in diameter to 10 acres. Rock outcrop is impermeable, so vegetative growth is limited to fractures in the rock structure. Surface runoff is very rapid, and there is no hazard of erosion.

This complex is used as rangeland and is suited to this use. It is limited for this use mainly by Rock outcrop and steepness of slope. Uniform grazing is hindered by Rock outcrop and steep slopes. Plant cover on this Coarsegold soil can easily deteriorate if it is overgrazed or mismanaged. Proper stocking rates should be maintained to obtain optimum production of vegetation. Soft chess, wild oats, burclover, and filaree are the main forage plants.

This soil is poorly suited to urban development. Steepness of slope, limited depth of soil, and rock

outcrop are the main limiting features for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIs (18), nonirrigated, and has a Storie Index of 19.

121—Crouch coarse sandy loam, 15 to 30 percent slopes. This deep soil is well drained and hilly. It is on ridges and uneven side slopes in the upper Sierra Nevada foothills. It formed in residual material weathered from quartz diorite. Areas of this map unit are irregular in shape and range from about 50 to 150 acres in size. In many areas the soil is dissected by deep drainageways. The vegetation is conifers, hardwoods, and shrubs and a few annual grasses and forbs. Elevation ranges from 3,500 feet to 7,600 feet. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 55 degrees F. The average frost-free season ranges from 140 to 200 days.

Typically, the surface layer is dark grayish brown and grayish brown coarse sandy loam about 22 inches thick. The subsoil is pale brown coarse sandy loam about 21 inches thick. The next layer is pale brown loamy sand about 27 inches thick. Below this is light gray, strongly weathered quartz diorite. In a few areas the surface layer is sandy loam.

Included with this soil in mapping are a few small areas of Holland loam, Sheephead coarse sandy loam, and Rock outcrop. Also included is a soil that has a subsoil of red or dark red clay loam over mica schist or quartz diorite and a soil that is less than 40 inches deep to weathered quartz diorite. There are a few areas of Crouch soil that has slope of more than 30 percent. These included soils make up about 15 percent of the mapped acreage.

This Crouch soil has moderately rapid permeability and low to moderate available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 40 to 80 inches.

This soil is used for livestock grazing and woodland.

This soil is suited to livestock grazing at elevations below 4,500 feet. The hazard of erosion and dense woody vegetation are the main problems. Soil erosion can be controlled by leaving adequate residue on the surface. If this soil is cleared of woody plants to create open spaces, it produces a good stand of desirable grasses and forbs. This soil responds well to seeding. It is well suited to the production of mountain brome, blue wildrye, and cheatgrass.

This soil is suited to woodland at elevations above 4,500 feet. It is well suited to the production of ponderosa pine. It is capable of producing 9,940 cubic feet of wood, or 62,200 board feet (International Rule), per acre of merchantable timber from a fully stocked, even-aged stand of 80-year-old trees. The major limitations of this soil are severe erosion hazard and plant competition. Special care is required during timber harvest to prevent soil erosion. Reduction of plant competition, especially from bear clover, is necessary to help insure seedling survival.

Roads for managing and harvesting woodlands are fairly difficult to locate and to build. In most places they need to be gravelled for year-round use. Roads and skid trails need to be protected from damage caused by runoff. Main roads require bridges, ditches, and culverts. Temporary and minor roads should be slanted downslope for surface drainage. When roads are constructed across creeks and drains, grades should be sloped downward toward the watercourse for a short distance on both sides. Fire is fairly difficult to control because of the steepness of slope.

This soil is poorly suited to urban development. Steepness of slope is the main problem for building sites, roads and streets, and septic tank absorption fields. Roads and streets and septic tank absorption fields should be installed on the contour.

This soil is in capability subclass VIe (22), nonirrigated, and has a Storie Index of 49.

122—Crouch coarse sandy loam, 30 to 50 percent slopes. This deep soil is well drained and steep. It is on ridges and uneven side slopes in the upper Sierra Nevada foothills. It formed in residual material weathered from quartz diorite. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 50 to 200 acres in size. In many areas the soil is dissected by deep drainageways. The vegetation is conifers, hardwoods, shrubs, and a few annual grasses and forbs. Elevation ranges from 3,500 feet to 7,600 feet. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 55 degrees F. The average frost-free season ranges from 140 to 200 days.

Typically, the surface layer is dark grayish brown and grayish brown coarse sandy loam about 22 inches thick. The subsoil is pale brown coarse sandy loam about 21 inches thick. The next layer is pale brown loamy sand about 27 inches thick. Below this is light gray, strongly weathered quartz diorite. In a few areas the surface layer is sandy loam.

Included with this soil in mapping are a few small areas of Holland loam and Sheephead coarse sandy loam. Also included is a soil that is less than 40 inches deep to weathered quartz diorite and a soil that has a subsoil of red or dark red clay loam over quartz diorite or mica schist. There are a few areas of Crouch soil that has slope of more than 50 percent. These included soils make up about 20 percent of the mapped acreage.

This Crouch soil has moderately rapid permeability and low to moderate available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 40 to 80 inches.

This soil is used for livestock grazing and woodland.

This soil is suited to livestock grazing at elevations below 4,500 feet. It is limited for this use by steepness of slope and dense woody vegetation. Because steepness of slope limits access by livestock, the less sloping soils are overgrazed. Trails or walkways are

needed to encourage livestock to graze on the steeper slopes. If this soil is cleared of woody plants to create open areas, it produces a good stand of desirable grasses and forbs. Mountain brome, blue wildrye, and cheatgrass are the main forage plants.

This soil is suited to woodland at elevations above 4,500 feet. It is well suited to the production of ponderosa pine. It is capable of producing 9,940 cubic feet of wood, or 62,200 board feet (International Rule), per acre of merchantable timber from a fully stocked, even-aged stand of 80-year-old trees. The major limitations of this soil are severe erosion hazard, steep slope, and plant competition. Special care is required during timber harvest to prevent soil erosion. Steep slope limits the use of machinery. Reduction of plant competition, especially from bear clover, is necessary to help insure seedling survival.

Roads for managing and harvesting woodlands are fairly difficult to locate and to build. In most places they need to be gravelled for year-round use. Roads and skid trails need to be protected from damage caused by runoff. Main roads require bridges, ditches, and culverts. Temporary and minor roads should be slanted downslope for surface drainage. When roads are constructed across creeks and drains, grades should be sloped downward toward the watercourse for a short distance on both sides. Fire is difficult to control on the steep slopes.

This soil is poorly suited to urban development. Steepness of slope is the main problem for building sites, roads and streets, and septic tank absorption fields.

This soil is capability subclass VIIe (22), nonirrigated, and has a Storie Index of 30.

123—Crouch-Rock outcrop complex, 15 to 50 percent slopes. This hilly to steep soil and Rock outcrop are on ridges and uneven side slopes in the upper Sierra Nevada foothills. Areas of this map unit are irregular in shape and range from about 300 to 3,000 acres in size. In many areas this soil is dissected by deep drainageways. The vegetation is conifers, hardwoods, shrubs, annual grasses, and forbs. Elevation ranges from 3,500 feet to 7,600 feet. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 55 degrees F. The average frost-free season ranges from 140 to 200 days.

This complex is about 45 percent Crouch soil and about 35 percent Rock outcrop.

Included in mapping are a few small areas of Holland loam and Sheephead coarse sandy loam. On the steeper slopes a few areas of soil are less than 40 inches deep to quartz diorite and small areas of soil have a subsoil of red or dark red clay loam over quartz diorite or mica schist. A few areas of Crouch soil that has slope of more than 50 percent are also included. These included soils make up 20 percent of the mapped acreage.

The Crouch soil is deep and well drained. It formed in residual material weathered from quartz diorite.

Typically, the surface layer is dark grayish brown and grayish brown coarse sandy loam about 22 inches thick. The subsoil is pale brown coarse sandy loam about 21 inches thick. The next layer is pale brown loamy sand about 27 inches thick. Below this is light gray strongly weathered quartz diorite. In a few areas the surface layer is sandy loam.

This Crouch soil has moderately rapid permeability and low to moderate available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 40 to 80 inches.

Rock outcrop is hard quartz diorite. Areas of Rock outcrop range from 4 to 100 feet in diameter to 10 acres. Rock outcrop is impermeable, so vegetative growth is limited to fractures in the rock structure. Surface runoff is very rapid, and there is no hazard of erosion.

This complex is used for livestock grazing and woodland. It is suited to livestock grazing at elevations below 4,500 feet. It is limited for this use mainly by Rock outcrop and steepness of slope. Uniform grazing is hindered by Rock outcrop and steep slope. On this Crouch soil, plant cover can deteriorate if it is overgrazed or mismanaged. Proper stocking rates should be maintained to obtain optimum production of vegetation. Woody plant cover is a problem. If the woody plants are cleared to create open areas, this soil produces a stand of desirable grasses. Mountain brome, blue wildrye, and cheatgrass are the main forage plants.

This soil is suited to woodland at elevations of about 4,500 feet; however, Rock outcrop reduces yields of commercial trees by about 35 percent. The soil is well suited to the production of ponderosa pine. It is capable of producing about 6,460 cubic feet of wood, or 40,430 board feet (International Rule), per acre of merchantable timber from a fully stocked, even-aged stand of 80-year-old trees. The major soil limitations are severe erosion, steep slope, rock outcrop, and plant competition. Special care is required during timber harvest to prevent soil erosion. Steep slope and Rock outcrop limit the use of machinery. Reduction of plant competition, especially from bear clover, is necessary to help insure seedling survival.

Roads for managing and harvesting woodlands are fairly difficult to locate and to build. In most places they need to be gravelled for year-round use. Roads and skid trails need to be protected from damage caused by runoff. Main roads require bridges, ditches, and culverts. Temporary and minor roads should be slanted downslope for surface drainage. When roads are constructed across creeks and drains, grades should be sloped downward toward the watercourse for a short distance on both sides. Fire is difficult to control because of hilly to steep slopes.

This complex is poorly suited to urban development. Steepness of slope and Rock outcrop are the main

limiting features for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIs (22), nonirrigated, and has a Storie Index of 17.

124—Exeter loam, 0 to 2 percent slopes. This well drained, nearly level soil is moderately deep to a hardpan. It formed on terraces in alluvium derived from weathered granitic sources. Slopes are smooth and simple. Areas of this map unit are irregular in shape and range from about 20 to 2,000 acres in size. The vegetation is annual grasses and forbs. Elevation ranges from 300 feet to 700 feet, but it is mainly below 500 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 250 to 300 days.

Typically, the surface layer is brown and dark yellowish brown loam about 14 inches thick. The subsoil is brown loam, reddish brown sandy clay loam, and yellowish red clay loam about 16 inches thick. Below the subsoil is a reddish brown hardpan about 13 inches thick. Below the hardpan is light yellowish brown sand and gravelly coarse sand that extends to a depth of 60 inches. In a few areas the surface layer is sandy loam.

Included with this soil in mapping are a few small areas of San Joaquin loam and Wyman loam. The Wyman soils are on small alluvial fans and are at low positions in the landscape. Also included are small areas of a soil that has a subsoil of brown heavy clay loam or clay. In some areas this Exeter soil is ripped, and the surface layer and subsoil are mixed. This Exeter soil generally contains many angular hardpan fragments the size of cobbles and gravel. In some areas the Exeter soil is very shallow, because it has been smoothed or leveled. These disturbed Exeter soils are inclusions. The included soils make up about 25 percent of the mapped acreage.

This Exeter soil has moderately slow permeability in the subsoil and very slow permeability in the hardpan. The available water capacity is moderate where the hardpan is ripped to a depth of 60 inches and is low where the hardpan has not been ripped. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 20 to 40 inches where the hardpan has not been ripped and is 60 inches or more where the hardpan has been ripped.

Most areas of this soil are used for orchards, vineyards, and cultivated crops. Oranges, olives, table grapes, plums, and cotton are the main crops. A few small areas are used for urban development.

This soil is suited to orchards, vineyards, and cultivated crops. The main limitation of this soil is the hardpan, which restricts root penetration. Normally the hardpan is ripped and shattered to deepen the soil. This creates a more even depth and aids in internal drainage. Proper tillage and maintaining crop residue on or near the surface help maintain soil tilth and water infiltration and help control erosion. Traffic on the soil should be avoided during wet periods to prevent soil compaction. Sprinklers and furrow irrigation are most suitable for orchards. Furrow irrigation is most suitable for vineyards and cultivated crops. Irrigation water should be properly managed to prevent waterlogging or a perched water table.

This soil is moderately suited to building sites and is poorly suited to roads and streets. It has moderately high clay content in the subsoil and cannot support heavy loads. This can be overcome by replacing the base material. The main problems for septic tank absorption fields are the moderately slow permeability of the subsoil and the cemented hardpan. This can be corrected by ripping the hardpan and increasing the size of the absorption field.

This soil is in capability unit IIIs-8 (17), irrigated, and IVs-8 (17), nonirrigated. It has a Storie Index of 35.

125—Exeter loam, 2 to 9 percent slopes. This well drained, undulating to gently rolling soil is moderately deep to a hardpan. It formed on terraces in alluvium derived from weathered granitic sources. In some places the surface is fairly smooth, but in others it is hummocky. Areas of this map unit are irregular in shape and range from about 20 to 2,500 acres in size. In a few areas the soil is dissected by shallow drainageways. The vegetation is annual grasses and forbs. Elevation ranges from 300 feet to 700 feet, but it is mainly below 500 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 250 to 300 days.

Typically, the surface layer is brown and dark yellowish brown loam about 14 inches thick. The subsoil is brown loam, reddish brown sandy clay loam, and yellowish red clay loam about 16 inches thick. Below the subsoil is a reddish brown hardpan about 13 inches thick. Below the hardpan is light yellowish brown sand and gravelly coarse sand that extends to a depth of 60 inches or more. In a few areas the surface layer is sandy loam.

Included with this soil in mapping are a few small areas of San Joaquin loam and Wyman loam. The Wyman soils are on small alluvial fans and are at low positions in the landscape. Also included with this soil are small areas of a soil that has a subsoil of brown heavy clay loam or clay. These included soils make up about 15 percent of the mapped acreage.

This Exeter soil has moderately slow permeability in the subsoil and very slow permeability in the hardpan. The available water capacity is low to moderate. Surface runoff is slow or medium, and the hazard of erosion is slight or moderate. The effective rooting depth is 20 to 40 inches.

Most areas of this soil are used as rangeland. A few small areas are used for orchards. The main orchard crops are oranges and olives.

This soil is suited to rangeland. Erosion hazard is a slight limitation. Erosion can be controlled by leaving

adequate residue on the surface. The soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, filaree, and burclover.

This soil is suited to orchards. The main limitations are the hardpan, which restricts root growth, and erosion of the steeper soil. Normally the hardpan is ripped and shattered to deepen the soil. This evens the depth of the soil and aids in internal drainage. Orchards can be protected from erosion by maintaining all crop residue on or near the surface and by using cover crops. Proper tillage and leaving crop residue on the surface help maintain soil tilth and water infiltration and prevent erosion. Traffic on the soil should be avoided during wet periods to prevent soil compaction. Sprinkler and drip irrigation are most suitable for orchards. Irrigation water must be properly managed on this soil to prevent waterlogging, a perched water table, and erosion.

This soil is moderately suited to building sites and poorly suited to roads and streets. The soil has moderately high clay content in the subsoil and cannot support heavy loads. This can be overcome by replacing the base material. The main problems for septic tank absorption fields are the moderately slow permeability of the subsoil and the cemented hardpan. This can be corrected by ripping the hardpan and increasing the size of the absorption field.

This soil is in capability unit IIIe-8 (17), irrigated, and IVe-8 (17), nonirrigated. It has a Storie Index of 33.

126—Fallbrook sandy loam, 9 to 15 percent slopes. This deep soil is well drained and rolling. It is on uneven side slopes in the lower Sierra Nevada foothills. Most of this soil is north of the town of Springville and east of the town of Milo. Small areas are in Drum Valley. This soil formed in residual material weathered from quartz diorite. Areas of this map unit are irregular in shape and range from about 10 to 200 acres in size. In many areas the soil is dissected by drainageways. The vegetation is annual grasses, forbs, and a few shrubs and hardwood trees. Elevation ranges from 600 to 3,500 feet. The mean annual precipitation is about 16 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 250 to 300 days.

Typically, the surface layer is yellowish brown sandy loam about 8 inches thick. The subsoil is reddish brown sandy clay loam about 43 inches thick. Below the subsoil is strongly weathered quartz diorite.

Included with this soil in mapping are a few small areas of Auberry sandy loam, Blasingame sandy loam, Cieneba coarse sandy loam, and Vista coarse sandy loam. Also included are a few small areas of a soil that has a subsoil of dark red clay, areas of Rock outcrop, and areas of Fallbrook soils where slope is more than 15 percent. These included soils make up about 20 percent of the mapped acreage.

This Fallbrook soil has moderately slow permeability and moderate to high available water capacity. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 40 to 60 inches.

This soil is used mainly as rangeland and is suited to this use. It has few limitations when used for grazing. It responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is moderately suited to building sites and roads and streets. The steepness of slope and the moderately high clay content in the subsoil are the main problems. Steep banks should be stabilized to prevent erosion. Topsoil can be stockpiled and used to reclaim areas that have been disturbed by cutting and filling. The moderately high clay content in the subsoil can cause foundations and roads to fail. This can be corrected by replacing the base material. Roads and streets built on the contour help control runoff. A problem for septic tank absorption fields is the moderately slow permeability in the subsoil. This can be corrected by increasing the size of the absorption field. Leach lines of the absorption field should be installed on the contour.

This soil is in capability unit IVe-1 (18), irrigated and nonirrigated. It has a Storie Index of 54.

127—Fallbrook sandy loam, 15 to 30 percent slopes. This deep soil is well drained and hilly. It is on uneven side slopes in the lower Sierra Nevada foothills. Most of this soil is north of the town of Springville and east of Milo. Small areas are in Drum Valley. The soil formed in residual material weathered from quartz diorite. There is some outcropping of rock. Areas of the map unit are irregular in shape and range from about 10 to 400 acres in size. In many areas the soil is dissected by drainageways. The vegetation is annual grasses, forbs, and a few shrubs and hardwood trees. Elevation ranges from 600 feet to 3,500 feet. The mean annual precipitation is about 16 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 250 to 300 days.

Typically, the surface layer is yellowish brown sandy loam about 8 inches thick. The subsoil is reddish brown sandy clay loam about 43 inches thick. Below the subsoil is strongly weathered quartz diorite.

Included with this soil in mapping are a few small areas of Auberry sandy loam, Blasingame sandy loam, Cieneba coarse sandy loam, and Vista coarse sandy loam. Also included are a few small areas of a soil that has a dark red clay subsoil and areas of Fallbrook soil where slope is more than 30 percent. These included soils make up about 20 percent of the mapped acreage.

This Fallbrook soil has moderately slow permeability and moderate to high available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 40 to 60 inches.

This soil is used as rangeland and is suited to this use. The hazard of erosion is the main problem. Erosion can be controlled by leaving adequate residue on the surface. This soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is poorly suited to urban development. Steepness of slope is the main problem for building sites, roads and streets, and septic tank absorption fields. Onsite investigation may indicate small isolated areas that are suitable for homesites.

This soil is in capability subclass VIe (18), nonirrigated, and has a Storie Index of 41.

128—Fallbrook sandy loam, 30 to 50 percent slopes. This deep soil is well drained and steep. It is on uneven side slopes in the lower Sierra Nevada foothills. Most of this soil is north of the town of Springville and east of Milo. Small areas are in Drum Valley. The soil formed in residual material weathered from quartz diorite. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 50 to 200 acres in size. In many areas the soil is dissected by drainageways. The vegetation is annual grasses, forbs, and a few shrubs and hardwood trees. Elevation ranges from 600 feet to 3,500 feet. The mean annual precipitation is about 16 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 250 to 300 days.

Typically, the surface layer is yellowish brown sandy loam about 8 inches thick. The subsoil is reddish brown sandy clay loam about 43 inches thick. Below the subsoil is strongly weathered quartz diorite.

Included with this soil in mapping are a few small areas of Auberry sandy loam, Blasingame sandy loam, Cieneba coarse sandy loam, and Vista coarse sandy loam. Also included are a few areas of a soil that has a subsoil of dark red clay and areas of Fallbrook soil where slope is more then 50 percent. These included soils make up about 20 percent of the mapped acreage.

This Fallbrook soil has moderately slow permeability and moderate to high available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 40 to 60 inches.

This soil is used as rangeland and is suited to this use. It is limited for this use mainly by steepness of slope. Because steepness of slope limits access by livestock, the less sloping soils are overgrazed. Trails or walkways are needed to encourage livestock to graze on the steeper slopes. Soft chess, wild oats, burclover, and filaree are the main forage plants.

This soil is poorly suited to urban development. Steepness of slope is the main problem for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIe (18), nonirrigated, and has a Storie Index of 25.

129—Fallbrook-Rock outcrop complex, 9 to 50 percent slopes. This rolling to steep soil and rock outcrop are on uneven side slopes in the lower Sierra Nevada foothills. Areas of this map unit are irregular in shape and range from about 100 to 1,000 acres in size. In many areas this soil is dissected by drainageways. The vegetation is annual grasses, forbs, and a few shrubs and hardwood trees. Elevation ranges from 600 feet to 3,500 feet. The mean annual precipitation is about 16 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 250 to 300 days.

This complex is about 60 percent Fallbrook soil and about 25 percent Rock outcrop.

Included in mapping are a few small areas of Auberry sandy loam, Blasingame sandy loam, Cieneba coarse sandy loam, and Vista coarse sandy loam. Also included are a few areas of a soil that has a subsoil of dark red clay and areas of Fallbrook soil where slope is more than 50 percent. These included soils make up 15 percent of the mapped acreage.

The Fallbrook soil is deep and well drained. It formed in residual material weathered from quartz diorite.

Typically, the surface layer is yellowish brown sandy loam about 8 inches thick. The subsoil is reddish brown sandy clay loam about 43 inches thick. Below the subsoil is strongly weathered quartz diorite.

This Fallbrook soil has moderately slow permeability and moderate to high available water capacity. Surface runoff is medium or rapid, and the hazard of erosion is moderate or high. The effective rooting depth is 40 to 60 inches.

Rock outcrop is hard quartz diorite. Areas of Rock outcrop range from 4 to 100 feet in diameter to 10 acres. Rock outcrop is impermeable, so vegetative growth is limited to fractures in the rock structure. Surface runoff is very rapid, and there is no hazard of erosion.

This complex is used as rangeland and is suited to this use. It is limited for this use mainly by Rock outcrop and steepness of slope. Uniform grazing is hindered by Rock outcrop and steep slope. Plant cover on this Fallbrook soil can easily deteriorate if overgrazed or mismanaged. Proper stocking rates should be maintained to obtain optimum production of vegetation. Soft chess, wild oats, burclover, and filaree are the main forage plants.

This unit is poorly suited to urban development. Steepness of slope and Rock outcrop are the main limiting features for building sites, roads and streets, and septic tank absorption fields. Onsite investigation may indicate small isolated areas that are suitable for homesites.

This soil is in capability subclass VIIs (18), nonirrigated, and has a Storie Index of 19.

130—Friant-Rock outcrop complex, 15 to 75 percent slopes. This hilly to very steep soil and Rock outcrop are on uneven side slopes in the lower Sierra Nevada foothills. Areas of this map unit are irregular in shape and range from about 50 to 3,000 acres in size. In many areas the soil is dissected by drainageways. The vegetation is annual grasses and forbs. Elevation ranges from 500 feet to 3,500 feet. The mean annual precipitation is about 18 inches, and the mean annual air

temperature is about 61 degrees F. The average frost-free season ranges from 210 to 280 days.

This complex is about 50 percent Friant soil and about 30 percent Rock outcrop.

Included in mapping are a few small areas of Cieneba coarse sandy loam, Coarsegold loam, Vista coarse sandy loam, and Walong sandy loam. Also included are a few areas of a soil that has a surface layer of brown loam and a subsoil of brown clay loam that is 50 percent or more gravel. These included soils make up 20 percent of the mapped acreage.

The Friant soil is shallow and well drained. It formed in residual material weathered from mica schist.

Typically, the surface layer is brown fine sandy loam and gravelly fine sandy loam about 18 inches thick. Below the surface layer is hard mica schist.

This Friant soil has moderately rapid permeability and very low available water capacity. Surface runoff is rapid or very rapid, and the hazard of erosion is high or very high. The effective rooting depth is 10 to 20 inches.

Rock outcrop is hard mica schist. These areas range from 2 to 400 feet in diameter to 10 acres. The Rock outcrop is impermeable, so vegetative growth is limited to fractures in the rock structure. Surface runoff is very rapid, and there is no hazard of erosion.

This complex is used as rangeland; however, this Friant soil is poorly suited to rangeland. This soil is limited for this use mainly by its shallow depth or moderately coarse texture. These limitations result in lack of rooting depth and low available water capacity. Plant cover can easily deteriorate if overgrazed or mismanaged. Proper stocking rates should be maintained to obtain optimum production of vegetation. Deterioration of plant cover can result in extensive erosion. Soft chess, wildoats, and filaree are the main forage plants. Uniform grazing is hindered by Rock outcrop and steep slope.

This complex is poorly suited to urban development. Steepness of slope, Rock outcrop, and shallow depth to bedrock are the main limiting features for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIs (18), nonirrigated, and has a Storie Index of 7

131—Grangeville silt loam, drained. This soil is very deep and somewhat poorly drained. It is on alluvial fans. It formed in alluvium derived from weathered granitic sources. Slope ranges from 0 to 2 percent. Slopes are uneven and complex. Some areas are depressional. Areas of this map unit are irregular in shape and range from about 10 to 850 acres in size. In many areas the soil is dissected by shallow drainageways. The vegetation is mainly annual grasses and forbs and scattered cottonwoods and willows that are along old stream channels. Elevation ranges from 200 feet to 2,000 feet, but mainly it is less than 850 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F The average frost-free season ranges from 225 to 300 days.

Typically, the surface layer is grayish brown silt loam about 14 inches thick. The underlying material is stratified brown, grayish brown, and light brownish gray silt loam, loam, loamy sand, and sandy loam to a depth of 64 inches. The soil has prominent and distinct mottles at a depth of 14 to 28 inches. It is calcareous to a depth of about 14 inches. In a few areas the surface layer is sandy loam, fine sandy loam, or loam.

Included with this soil in mapping are a few small areas of San Emigdio loam, Tujunga sand, and Yettem sandy loam. Also included are a few small areas of a soil that has a compacted layer at a depth of 36 inches and a few small areas of a soil that has a surface layer of gray silt loam. These included soils make up about 10 percent of the mapped acreage.

This Grangeville soil has moderately rapid permeability and high available water capacity. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more. Pumping ground water to irrigated crops has lowered the water table to a depth of more than 6 feet. The flow of streams is controlled to the extent that most areas are rarely flooded.

Most areas of this soil are used for cultivated crops, orchards, and irrigated pasture. Alfalfa hay, barley, wheat, and olives are the main crops. A few small areas are used as rangeland. Expected yield for alfalfa hay is about 7.5 tons per acre, for irrigated barley is about 94 bushels per acre, and for irrigated wheat is about 100 bushels per acre. Expected yield from irrigated pasture is about 12 animal units per month.

This soil is well suited to cultivated crops and orchards. It has few hazards or limitations when farmed. Proper tillage and maintaining crop residue on or near the surface help to maintain soil tilth, fertility, and water infiltration. Furrow, border, and sprinkler irrigation are most suitable for cultivated crops. Sprinkler and drip irrigation are most suitable for orchards.

This soil is well suited to irrigated pasture. It has few limitations for this use. Occasionally mowing or clipping the grass helps maintain uniform growth, discourages selective grazing, and reduces clumping. Sprinkler and border irrigation are most suitable for irrigated pasture.

This soil is suited to use as rangeland. It has few limitations when used for grazing. It responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is poorly suited to urban development. During rare periods of heavy rainfall, flooding is the main problem for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability class I (17), irrigated, and capability unit IVc-1 (17), nonirrigated. It has a Storie Index of 72.

132—Greenfield sandy loam, 0 to 2 percent slopes. This very deep soil is well drained and nearly level. It is on alluvial fans. It formed in alluvium derived from weathered granitic sources. Slopes are smooth and

simple. Areas of this map unit are irregular in shape and range from about 10 to 300 acres in size. The vegetation is mainly annual grasses and forbs. Elevation ranges from 300 feet to 2,000 feet, but it is mainly less than 850 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 225 to 300 days.

Typically, the surface layer is brown sandy loam about 10 inches thick. The subsoil is dark yellowish brown and brown sandy loam about 39 inches thick. The substratum is brown sandy loam to a depth of 70 inches.

Included with this soil in mapping are a few small areas of Honcut sandy loam and Tujunga sand. Also included are small areas of a soil that has a subsoil of brown loam or clay loam that is calcareous. These included soils make up about 15 percent of the mapped acreage.

This Greenfield soil has moderately rapid permeability and moderate to high available water capacity. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

Most areas of this soil are used for orchards and vineyards. Oranges, olives, walnuts, plums, and table grapes are the main crops. A few small areas are used for urban development.

This soil is well suited to orchards and vineyards. It has few hazards or limitations when it is farmed. Proper tillage and maintaining crop residue on or near the surface help to maintain soil tilth, water infiltration, and fertility. Furrow, border, sprinkler, and drip irrigation are most suitable for orchards. Furrow and drip irrigation systems are most suitable for vineyards.

This soil is well suited to urban development. It has few limitations for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability class I (17), irrigated, and capability unit IVc-1 (17), nonirrigated. It has a Storie Index of 90.

133—Greenfield sandy loam, 2 to 5 percent slopes. This very deep soil is well drained and gently sloping. It is on alluvial fans. It formed in alluvium derived from granitic sources. Slopes are smooth and simple. Areas of this map unit are irregular in shape and range from about 10 to 200 acres in size. In a few areas the soil is dissected by shallow drainageways. The vegetation is mainly annual grasses and forbs. Elevation ranges from 300 feet to 2,000 feet, but it is mainly less than 850 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 225 to 300 days.

Typically, the surface layer is brown sandy loam about 10 inches thick. The subsoil is dark yellowish brown and brown sandy loam about 39 inches thick. The substratum is brown sandy loam to a depth of 70 inches.

Included with this soil in mapping are a few small areas of Honcut sandy loam and Tujunga sand. Also included are small areas of an eroded soil near drainageways. A large gully about 20 to 30 feet deep runs through this mapping unit. This gully is in an area northeast of Ducor. These included soils make up about 15 percent of the mapped acreage.

This Greenfield soil has moderately rapid permeability and moderate to high available water capacity. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

This soil is used as rangeland and is suited to this use. Erosion hazard is a slight limitation. Erosion can be controlled by leaving adequate residue on the surface. This soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, filaree, and burclover.

This soil is well suited to urban development. It has few limitations for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability unit IIe-1 (17), irrigated, and IVe-1 (17), nonirrigated. It has a Storie Index of 86.

134—Havala loam, 0 to 2 percent slopes. This very deep soil is well drained and nearly level. It is on alluvial fans. It formed in alluvium derived from granitic sources. Slopes are smooth and simple. Areas of this map unit are irregular in shape and range from about 10 to 200 acres in size. The vegetation is mainly annual grasses and forbs. Elevation ranges from 300 feet to 2,000 feet, but it is mainly less than 1,000 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 225 to 300 days.

Typically, the surface layer is grayish brown and brown loam about 16 inches thick. The upper part of the subsoil is brown and yellowish brown sandy clay loam and clay loam to a depth of 45 inches. The lower part is yellowish brown sandy loam to a depth of 56 inches. Below the subsoil is light yellowish brown sandy loam to a depth of 64 inches. In a few areas the surface layer is sandy loam.

Included with this soil in mapping are a few small areas of Honcut sandy loam, Wyman loam, and Yettem sandy loam. Also included are a few small areas of Havala soil that has slope of more than 2 percent. These included soils make up about 15 percent of the mapped acreage.

This Havala soil has moderately slow permeability and high available water capacity. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

This soil is used for orchards and cultivated crops. Oranges, olives, plums, and cottom are the main crops.

This soil is well suited to orchards and cultivated crops. It has few limitations when it is farmed. Proper tillage and maintaining crop residue on or near the surface help maintain soil tilth, water infiltration, and fertility. Furrow irrigation, sprinkler irrigation, and drip irrigation are most suitable for orchards. Furrow irrigation is the most suitable for cultivated crops.

This soil is moderately suited to building sites and roads and streets. The soil has moderately high clay content in the subsoil and cannot bear heavy loads. This can be overcome by replacing the base material. The main problem for septic tank absorption fields is the moderately slow permeability of the subsoil. This can be corrected by increasing the size of the absorption field and by filling the trench lines below the filter pipe with coarse sand and gravel.

This soil is in capability class I (17), irrigated, and capability unit IVc-1 (17), nonirrigated. It has a Storie Index of 85.

135—Havala loam, 2 to 5 percent slopes. This very deep soil is well drained and gently sloping. It is on alluvial fans. It formed in alluvium derived from granitic sources. Slopes are smooth and simple. Areas of this map unit are irregular in shape and range from about 10 to 400 acres in size. In a few areas the soil is dissected by shallow drainageways. The vegetation is mainly annual grasses and forbs. Elevation ranges from 300 feet to 2,000 feet, but it is mainly less than 1,000 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 225 to 300 days.

Typically, the surface layer is grayish brown and brown loam about 16 inches thick. The upper part of the subsoil is brown and yellowish brown sandy clay loam and clay loam to a depth of 45 inches. The lower part is yellowish brown sandy loam to a depth of 56 inches. Below the subsoil is light yellowish brown coarse sandy loam to a depth of 64 inches. In a few areas the surface layer is sandy loam.

Included with this soil in mapping are a few small areas of Honcut sandy loam, Wyman loam, and Yettem sandy loam. Also included are a few small areas in Eshom Valley of a similar soil that is above 3,000 feet, small areas of a soil that has a strongly calcareous surface layer and subsoil, and a few small areas of Havala soil where slope is less than 2 percent. These included soils make up about 15 percent of the mapped acreage.

This Havala soil has moderately slow permeability and high available water capacity. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

Most areas of this soil are used as rangeland. A few areas are used for orchards. Oranges and olives are the main crops. A few small areas are used for urban development.

This soil is suited to rangeland. Erosion is a slight limitation and can be controlled by leaving adequate residue on the surface. This soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, filaree, and burclover.

This soil is suited to orchards. Erosion is the main limitation. Soil erosion in orchards can be controlled by farming across the slope, by maintaining crop residue on or near the surface and by using cover crops. Proper tillage and leaving crop residue on the surface help maintain soil tilth, water infiltration, and fertility. Sprinkler and drip irrigation systems are most suitable for orchards. Irrigation water should be properly managed to prevent erosion.

This soil is moderately suited to building sites and roads and streets. The soil has moderately high clay content in the subsoil and cannot bear heavy loads. This can be overcome by replacing the base material. The main problem for septic tank absorption fields is the moderately slow permeability of the subsoil. This can be corrected by increasing the size of the absorption field and by filling the trench lines below the filter pipe with coarse sand and gravel.

This soil is in capability unit IIe-1 (17), irrigated, and IVe-1 (17), nonirrigated. It has a Storie Index of 81.

136—Holland loam, 15 to 30 percent slopes. This very deep soil is well drained and hilly. It is on uneven side slopes in the upper Sierra Nevada foothills. It formed in residual material weathered from quartz diorite. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 50 to 1,000 acres in size. In many areas the soil is dissected by drainageways. The vegetation is conifers, hardwoods, shrubs, annual grasses, and forbs. Elevation ranges from 3,500 feet to 5,500 feet. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 55 degrees F. The average frost-free season ranges from 150 to 200 days.

Typically, the surface layer is grayish brown and dark grayish brown loam about 19 inches thick. The subsoil is brown and reddish brown loam and clay loam about 61 inches thick. Below the subsoil is very pale brown quartz diorite. In a few areas the surface layer is sandy loam.

Included with this soil in mapping are a few small areas of Auberry sandy loam, Blasingame sandy loam, Coarsegold loam, and Crouch coarse sandy loam. Also included is a similar soil that has a red or yellowish red subsoil and a few areas of Holland soil where slope is less than 15 percent or more than 30 percent. These included soils make up about 15 percent of the mapped acreage.

This Holland soil has moderately slow permeability and high available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 60 to 80 inches.

This soil is used for livestock grazing and woodland. It is suited to grazing. The hazard of erosion and dense woody vegetation are the main problems Soil erosion can be controlled by leaving adequate residue on the surface. If this soil is cleared of woody plants to create open areas, it produces a good stand of desirable grasses and forbs. This soil responds well to seeding. It is well suited to the production of mountain brome, blue wildrye, and deerbrush.

This soil is suited to woodland at elevations above 4,000 feet. It is well suited to the production of ponderosa pine. It is capable of producing 9,940 cubic feet of wood, or 62,200 board feet (International Rule), per acre of merchantable timber from a fully stocked, even-aged stand of 80-year-old trees. The major limitations of this soil are severe hazard of erosion and plant competition. Special care is required during timber harvest to prevent soil erosion. Reduction of plant competition is necessary to be sure of seedling survival. During periods of wetness, logging operations are impractical. In winter snow covers the ground at high elevations and hinders the use of machinery.

Roads for managing and harvesting woodlands are fairly difficult to locate and to build. In most places they need to be gravelled for year-round use. Roads and skid trails need to be protected from damage caused by runoff. Main roads require bridges, ditches, and culverts. Temporary and minor roads should be slanted downslope for surface drainage. When roads are constructed across creeks and drains, grades should be sloped downward toward the watercourse for a short distances on both sides. Fire is fairly difficult to control on the steep slopes.

This soil is poorly suited to urban development. The main problems for building sites and roads and streets are steep slope and inadequate strength of the soil to support heavy loads. The main problems for septic tank absorption fields are steep slope and moderately slow permeability. Onsite investigation may indicate small isolated areas that are suitable for homesites.

This soil is in capability subclass VIe (22), nonirrigated, and has a Storie Index of 52.

137—Holland loam, 30 to 50 percent slopes. This very deep soil is well drained and steep. It is on uneven side slopes in the upper Sierra Nevada foothills. It formed in residual material weathered from quartz diorite. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 50 to 1,000 acres in size. In many areas the soil is dissected by drainageways. The vegetation is conifers, hardwoods, shrubs, annual grasses, and forbs. Elevation ranges from 3,500 feet to 5,500 feet. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 55 degrees F. The average frost-free season ranges from 150 to 200 days.

Typically, the surface layer is grayish brown and dark grayish brown loam about 19 inches thick. The subsoil is brown and reddish brown loam and clay loam about 61 inches thick. Below the subsoil is very pale brown quartz diorite. In a few areas the surface layer is sandy loam.

Included with this soil in mapping are a few small areas of Auberry sandy loam, Blasingame sandy loam, Coarsegold loam, Crouch coarse sandy loam, and Sheephead coarse sandy loam. Also included with this soil is a similar soil that has a subsoil of red, yellowish red, or dark red and a few areas of Holland soil that has slope of more than 50 percent. These included soils make up about 20 percent of the mapped acreage.

This Holland soil has moderately slow permeability and high available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 60 to 80 inches.

This soil is used for livestock grazing and woodland.

This soil is suited to grazing at elevations below 4,000 feet. It is limited for this use mainly by steepness of slope and dense woody vegetation. Because steepness of slope limits access by livestock, the less sloping soils are overgrazed. Trails or walkways are needed to encourage livestock to graze on the steeper slopes. If this soil is cleared of woody plants to create open areas, it produces a good stand of desirable grasses and forbs. Mountain brome, blue wildrye, and deerbrush are the key forage and browse plants.

This soil is suited to use as woodland at elevations above 4,000 feet. It is well suited to the production of ponderosa pine. It is capable of producing 9,940 cubic feet of wood, or 62,200 board feet (International Rule), per acre of merchantable timber from a fully stocked, even-aged stand of 80-year-old trees. The major soil limitations are severe erosion hazard, steep slopes, and plant competition. Special care is required during timber harvest to prevent soil erosion. Steep slope limits the use of machinery. Reduction of plant competition is necessary to help insure seedling survival. During periods of wetness, logging operations are impractical. In winter snow covers the ground at high elevations and hinders the use of machinery.

Roads for managing and harvesting woodlands are fairly difficult to locate and to build. In most places they need to be gravelled for year-round use. Roads and skid trails need to be protected from damage caused by runoff. Main roads require bridges, ditches, and culverts. Temporary and minor roads should be slanted downslope for surface drainage. When roads are constructed across creeks and drains, grades should be sloped downward toward the watercourse for a short distance on both sides. Fire is difficult to control on the steep slopes.

This soil is poorly suited to urban development. Steepness of slope is the main problem for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIe (22), nonirrigated, and has a Storie Index of 32.

138—Holland-Rock outcrop complex, 15 to 50 percent slopes. This moderately steep to steep soil and Rock outcrop are on uneven side slopes in the upper Sierra Nevada foothills. Areas of this map unit are irregular in shape and range from about 70 to 1,500 acres in size. In many areas the soil is dissected by deep drainageways. The vegetation is conifers, hardwoods, shrubs, annual grasses, and forbs. Elevation ranges from 3,500 feet to 5,500 feet. The mean annual precipitation

is about 35 inches, and the mean annual air temperature is about 55 degrees F. The average frost-free season ranges from 150 to 200 days.

This complex is about 45 percent Holland soil and about 30 percent Rock outcrop.

Included in mapping are a few small areas of Auberry sandy loam, Blasingame sandy loam, Coarsegold loam, Crouch coarse sandy loam, and Sheephead coarse sandy loam. Also included is a similar soil that has a red, yellowish red, or dark red subsoil and a few areas of Holland soil that has slope of more than 50 percent. These soils make up 25 percent of the mapped acreage.

The Holland soil is very deep and well drained. It formed in residual material weathered from quartz diorite.

Typically, the surface layer is grayish brown and dark brown loam about 19 inches thick. The subsoil is brown and reddish brown loam and clay loam about 61 inches thick. Below the subsoil is very pale brown quartz diorite. In a few areas the surface layer is sandy loam.

This Holland soil has moderately slow permeability and high available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 60 to 80 inches.

Rock outcrop is hard quartz diorite. Areas of Rock outcrop range from 4 to 200 feet in diameter to 10 acres. Rock outcrop is impermeable, so vegetative growth is limited to fractures in the rock structure. Surface runoff is very rapid, and there is no hazard of erosion.

This complex is used for livestock grazing and woodland.

This complex is suited to grazing at elevations below 4,000 feet. It is limited for this use mainly by Rock outcrop and steepness of slope. Uniform grazing is hindered by Rock outcrop and steep slopes. Plant cover on this Holland soil can deteriorate if it is overgrazed or mismanaged. Proper stocking rates should be maintained to obtain optimum production of vegetation. Woody plant cover is a problem. If the woody plants are cleared to create open areas, this soil produces a stand of desirable grasses and shrubs. Mountain brome, blue wildrye, and deerbrush are the main forage and browse plants.

This soil is suited to woodland at elevations above 4,000 feet; however, Rock outcrop reduces yields of commercial trees by about 30 percent. It is well suited to the production of ponderosa pine. It is capable of producing 6,460 cubic feet of wood, or 40,430 board feet (International Rule), per acre of merchantable timber from a fully stocked, even-aged stand of 80-year-old trees. The major soil limitations are severe erosion hazard, steep slopes, Rock outcrop, and plant competition. Special care is required during timber harvest to prevent soil erosion. Steep slopes and Rock outcrop limit the use of machinery. Reduction of plant competition is necessary to help insure seedling survival. During periods of wetness, logging operations are impractical. In winter snow covers the ground at higher elevations and hinders the use of machinery.

Roads for managing and harvesting woodlands are fairly difficult to locate and to build. In most places they need to be gravelled for year-round use. Roads and skid trails need to be protected from damage caused by runoff. Main roads require bridges, ditches, and culverts. Temporary and minor roads should be slanted downslope for surface drainage. When roads are constructed across creeks and drains, grades should be sloped downward toward the watercourse for a short distance on both sides. Fire is difficult to control on hilly to steep slopes.

This complex is poorly suited to urban development. Steepness of slope and Rock outcrop are the main limiting features for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIs (22), nonirrigated, and has a Storie Index of 23.

139—Honcut sandy loam, 0 to 2 percent slopes. This very deep soil is well drained and nearly level. It is on alluvial fans. It formed in alluvium derived from granitic sources. Slopes are smooth and simple. Areas of this map unit are irregular in shape and range from about 10 to 300 acres in size. The vegetation is mainly annual grasses and forbs. Elevation ranges from 300 feet to 2,000 feet but is dominately less than 850 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 225 to 280 days.

Typically, the surface layer is brown sandy loam about 11 inches thick. The underlying material is brown and pale brown sandy loam to a depth of 70 inches.

Included with this soil in mapping are a few small areas of Greenfield sandy loam, San Emigdio loam, Tujuga sand, and Yettem sandy loam. Also included are a few areas of soil which is similar to this Honcut soil but which formed in alluvium derived from gabbro and mica schist. These soils are near the town of Lindsey. Another soil, near the northwest boundary of the survey area, has a surface layer of brown sandy loam and a subsoil of brown and reddish brown sandy clay loam. A few small areas of a soil that is strongly calcareous at a depth of 24 to 40 inches are also included. These included soils make up about 20 percent of the mapped acreage.

This Honcut soil has moderately rapid permeability and moderate available water capacity. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

Most areas of this soil are used for orchards and vineyards. Oranges, olives, plums, walnuts, and table grapes are the main crops. A few small areas are used for urban development.

This soil is well suited to orchards and vineyards. It is limited mainly by the moderate available water capacity. Proper tillage and maintaining crop residue on or near the surface help maintain soil tilth, water infiltration, and fertility. Furrow, border, sprinkler, and drip irrigation systems are most suitable for orchards. Furrow and drip irrigation systems are most suitable for vineyards.

This soil is well suited to urban development. It has few limitations for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability unit IIs-4 (17), irrigated, and capability unit IVs-4 (17), nonirrigated. It has a Storie Index of 95.

140—Honcut sandy loam, 2 to 5 percent slopes. This very deep soil is well drained and gently sloping. It is on alluvial fans. It formed in alluvium derived from weathered granitic sources. Slopes are smooth and simple. Areas of this map unit are irregular in shape and range from about 10 to 200 acres in size. In a few areas this soil is dissected by shallow drainageways. The vegetation is mainly annual grasses and forbs. Elevation ranges from 300 feet to 2,000 feet but is dominately less than 850 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 225 to 280 days.

Typically, the surface layer is brown sandy loam about 11 inches thick. The underlying material is brown and pale brown sandy loam to a depth of 70 inches.

Included with this soil in mapping are a few small areas of Greenfield sandy loam, San Emigdio loam, Tujunga sand, and Yettem sandy loam. Also included are small areas of a soil that is strongly calcareous at a depth of 24 to 40 inches and a few small areas of eroded soils near drainageways. These included soils make up about 20 percent of the mapped acreage.

This Honcut soil has moderately rapid permeability and moderate available water capacity. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

This soil is used as rangeland and is suited to this use. Erosion is a slight limitation and can be controlled by leaving adequate residue on the surface. The soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is well suited to urban development. It has few limitations for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability unit IIe-1 (17), irrigated, and IVe-1 (17), nonirrigated. It has a Storie Index of 90.

141—Las Posas loam, 9 to 15 percent slopes. This moderately deep soil is well drained and strongly sloping. It is on uneven side slopes in the lower Sierra Nevada foothills. It formed in residual material weathered from gabbro. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 10 to 150 acres in size. In many areas this soil is dissected by drainageways. The vegetation is annual grasses, forbs, and a few shrubs and hardwood trees. Elevation ranges from 300 feet to 3,000 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 240 to 290 days.

Typically, the surface layer is reddish brown loam about 9 inches thick. The subsoil is dark red clay and clay loam about 23 inches thick. Below the subsoil is light brownish gray weathered gabbro. In a few areas the surface layer is clay loam.

Included with this soil in mapping are a few small areas of Blasingame sandy loam, Coarsegold loam, and Trabuco loam. Also included are a few small areas of a soil that has a subsoil of brown clay loam and a few areas of Las Posas soil that has slope of more than 15 percent. These included soils make up about 20 percent of the mapped acreage.

This Las Posas soil has slow permeability and low to moderate available water capacity. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 20 to 40 inches.

This soil is used as rangeland and is suited to this use. The clay subsoil is the main problem. During periods of heavy rainfall, this soil is subject to waterlogging. During these periods the vegetation should not be grazed because the soil compacts. This soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is poorly suited to urban development. The high clay content in the subsoil is the main problem for building sites and roads and streets. This can be corrected by replacing the base materials. The problems for septic tank absorption fields are the slow permeability of the subsoil and limited depth of the soil. If homes are built on this soil, use of community sewer systems should be considered.

This soil is in capability unit IVe-3 (18), irrigated and nonirrigated. It has a Storie Index of 55.

142—Las Posas loam, 15 to 30 percent slopes. This moderately deep soil is well drained and hilly. It is on uneven side slopes in the lower Sierra Nevada foothills. It formed in residual material weathered from gabbro. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 20 to 200 acres in size. In many areas the soil is dissected by drainageways. The vegetation is annual grasses, forbs, and a few shrubs and hardwood trees. Elevation ranges from 300 feet to 3,000 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 240 to 290 days.

Typically, the surface layer is reddish brown loam about 9 inches thick. The subsoil is dark red clay and clay loam about 23 inches thick. Below the subsoil is light brownish gray weathered gabbro. In a few areas the surface layer is clay loam.

Included with this soil in mapping are a few small areas of Blasingame sandy loam, Coarsegold loam, and Trabuco loam. Also included are a few areas of Las Posas soil that has slope of more than 30 percent. These included soils make up about 20 percent of the mapped acreage.

This Las Posas soil has slow permeability and low to moderate available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 20 to 40 inches.

This soil is used as rangeland and is suited to this use. The hazard of erosion and clay subsoil are the main problems. Erosion can be controlled by leaving adequate residues on the surface. During periods of heavy rainfall, this soil is subject to waterlogging. During these periods the vegetation should not be grazed because the soil compacts. This soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is poorly suited to urban development. Steepness of slope and high clay content in the subsoil are the main problems for building sites, roads and streets, and septic tank absorption fields. Use of community sewer systems should be considered if these soils are used for housing development.

This soil is in capability subclass VIe (18), nonirrigated, and has a Storie Index of 42.

143—Las Posas loam, 30 to 50 percent slopes. This moderately deep soil is well drained and steep. It is on uneven side slopes in the lower Sierra Nevada foothills. It formed in residual material weathered from gabbro. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 20 to 500 acres in size. In many areas this soil is dissected by drainageways. The vegetation is annual grasses, forbs, and a few shrubs and scattered hardwood trees. Elevation ranges from is 300 feet to 3,000 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from about 240 to 290 days.

Typically, the surface layer is reddish brown loam about 9 inches thick. The subsoil is dark red clay and clay loam about 23 inches thick. Below the subsoil is light brownish gray, weathered gabbro. In a few areas the surface layer is clay loam.

Included with this soil in mapping are a few small areas of Blasingame sandy loam, Coarsegold loam, and Trabuco loam. Also included are a few small areas of a soil which is similar to this Las Posas soil but which formed in residual material of rhyolite or serpentine. A few areas of Las Posas soil that has slope of more than 50 percent are also included. These included soils make up about 20 percent of the mapped area.

This Las Posas soil has slow permeability and low to moderate available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 20 to 40 inches.

This soil is used as rangeland and is suited to this use. It is limited mainly by steepness of slope and a clay subsoil. Because steepness of slope limits access by livestock, the less sloping soils are overgrazed. Trails or walkways are needed to encourage livestock to graze on the steeper slopes. During periods of heavy rainfall, this soil is subject to waterlogging. During these periods vegetation should not be grazed because the soil compacts. Soft chess, wild oats, burclover, and filaree are the main forage plants.

This soil is poorly suited to urban development. Steepness of slope and high clay content in the subsoil are the main problems for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIe (18), nonirrigated, and has a Storie Index of 26.

144—Las Posas-Rock outcrop complex, 9 to 50 percent slopes. This strongly sloping to steep soil and Rock outcrop are on uneven side slopes in the lower Sierra Nevada foothills. Areas of this map unit are irregular in shape and range from about 20 to 600 acres in size. In many areas the soil is dissected by drainageways. The vegetation is annual grasses, forbs, and a few shrubs and scattered hardwood trees. Elevation ranges from 300 feet to 3,000 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 240 to 290 days.

This complex is about 45 percent Las Posas soil and about 30 percent Rock outcrop.

Included in mapping are a few small areas of Blasingame sandy loam, Coarsegold loam, and Trabuco loam. Also included are a few areas of Las Posas soil that has slope of more than 50 percent. These included soils make up 25 percent of the mapped acreage.

Las Posas soil is moderately deep and well drained. It formed in residual material weathered from gabbro.

Typically, the surface layer is reddish brown loam about 9 inches thick. The subsoil is dark red clay and clay loam about 23 inches thick. Below the subsoil is light brownish gray, weathered gabbro. In a few areas the surface layer is clay loam.

This Las Posas soil has slow permeability and low to moderate available water capacity. Surface runoff is medium or rapid, and the hazard of erosion is moderate or high. The effective rooting depth is 20 to 40 inches.

Rock outcrop is hard gabbro. These areas range from 4 to 200 feet in diameter to 10 acres. Rock outcrop is impermeable so vegetative growth is limited to fractures in the rock structure. Surface runoff is very rapid, and there is no hazard of erosion.

This complex is used for rangeland and is suited to this use. It is limited for this use mainly by Rock outcrop, steepness of slope, and clay subsoil. Uniform grazing is hindered by Rock outcrop and the steep slopes. During periods of heavy rainfall, this Las Posas soil is subject to waterlogging. During these periods vegetation should not be grazed because the soil compacts. Plant cover can easily deteriorate if overgrazed or mismanaged. Proper stocking rates should be maintained to obtain optimum production of vegetation. Soft chess, wild oats, burclover, and filaree are the main forage plants.

This complex is poorly suited to urban development. Steepness of slope, Rock outcrop, and high clay content in the subsoil are the main limiting features for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIs (18), nonirrigated, and has a Storie Index of 19.

145—Lewis clay loam, This moderately well drained, saline-alkali soil is moderately deep to a hardpan. It is in basins that have slope of 0 to 2 percent. It formed in alluvium derived from mixed, weathered rock sources. In some places the surface is fairly smooth, but in others the surface has a hummocky relief. Areas of this map unit are irregular in shape and range from about 10 to 250 acres in size. In a few areas the soil is dissected by shallow drainageways. The vegetation is mainly salt-tolerant grasses and weeds. Elevation ranges from 300 feet to 600 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 250 to 300 days.

Typically, the surface layer is grayish brown clay loam about 6 inches thick. The subsoil is grayish brown and pale brown clay and light yellowish brown sandy clay loam about 32 inches thick. Below the subsoil is a light yellowish brown hardpan about 14 inches thick. The next layer is light yellowish brown sandy clay loam to a depth of 60 inches. The subsoil is calcareous and has moderate to high amounts of sodium. In a few areas the surface layer is fine sandy loam.

Included with this soil in mapping are a few small areas of Exeter loam and San Joaquin loam. Also included are small areas of a soil that has a surface layer and subsoil of light brownish gray fine sandy loam. The substratum of this soil is very pale brown fine sandy loam to a depth of 60 inches. These included soils make up about 10 percent of the mapped acreage.

The subsoil and hardpan have very slow permeability. The available water capacity is low. Surface runoff is slow, and the hazard of erosion is slight. Where the soil has not been reclaimed, the effective rooting depth is limited to the surface layer because of the moderate to high amounts of sodium in the subsoil. In areas where the soil has been reclaimed and the hardpan has been ripped, the effective rooting depth is 40 inches or more, depending on the depth of ripping.

Most areas of this soil are used as rangeland. A few small areas adjacent to Lewis Creek and an area in Round Valley are used for orchards. The main crop is olives. A few small areas are used for irrigated pasture. After the soil is reclaimed, expected yields from irrigated pasture is about 10 animal units per month.

This soil is suited to use as rangeland. Soil compaction and toxic salts are the main soil limitations. Compaction is less if the soil is grazed when the moisture content is less than field capacity. A program to reduce toxic salts in the soil helps overcome the concentration of soluble salts and sodium. The soil responds to fertilizer and to seeding of salt-tolerant grasses and forbs. Filaree, saltgrass, and soft chess are the main adapted forage plants.

This soil is poorly suited to orchards. The toxic salts and duripan limit the use of the soil for orchards. Deep ripping shatters the hardpan, which improves drainage and allows root penetration. A program to reduce toxic salt helps overcome the concentration of salts and sodium in the subsoil Reducing toxic salts includes leaching, applying prescribed amounts of gypsum or sulfur, and incorporating crop residue into the soil. Salt-tolerant crops should be grown while this soil is being reclaimed. Proper tillage and maintaining crop residue on or near the surface help maintain soil tilth, water infiltration, and fertility. After the soil has been reclaimed, furrow, sprinkler, and drip irrigation systems are most suitable for orchards.

Irrigated pasture is a suitable use for this soil after it has been reclaimed. Plants selected for the pasture should be tolerant of salt. The hardpan in this soil should be ripped before it is used for pasture, and the soil should be reclaimed by reducing the salt content. The clay content of this soil makes soil compaction a hazard. Grazing the pasture should be done when the soil has a moisture content that is somewhat below field capacity. Border and sprinkler irrigation are most suitable for irrigated pasture. Occasional mowing or clipping grass helps maintain uniform growth, discourages selective grazing, and reduces clumpiness.

This soil is poorly suited to building sites, roads and streets, and septic tank absorption fields. The soil has high clay content, very slow permeability of the subsoil, and a cemented hardpan. It cannot bear heavy loads. The problems for building sites and roads and streets can be overcome by replacing the base material. Severe problems for septic tank filter fields are the very slow permeability of the subsoil and the cemented hardpan. Onsite investigation is needed to determine the best method of sewage disposal. Investigations may reveal more permeable soil material below the hardpan that would be suitable for septic tank absorption fields.

This soil is in capability unit IIIs-6 (17), irrigated, and IVs-6 (17), nonirrigated. It has a Storie Index of 15.

146—Pits. This map unit consists of open excavations from which most of the soil material has been removed. In many places rock or sand and gravel are exposed. These areas support few or no plants. A few of the pits mapped are now idle Some are basins for small ponds; others are sites for trash disposal.

Sand and gravel pits are located mainly along the Kaweah and Tule Rivers. Most of these pits are in use and are increasing in size as the sand and gravel are excavated. The pits that were used as aggregate sources in constructing the Terminus and Success Dams are now idle or are being used as ponds and small lakes for recreation.

Borrow pits for soil materials are widely scattered in the soil survey area. These pits have provided material ranging in texture from sand to clay loam for building roads, for building earth dams or levees, as fill for building sites, and for farming purposes.

Small rock quarries in the foothills are used as a source of crushed rock for road building, for building construction, and for lining levees. A standard map symbol is used to locate pits or quarries too small to be delineated separately.

This miscellaneous area is in capability class VIII. It has a Storie Index rating of less than 10.

147—Porterville clay, 0 to 2 percent slopes. This very deep soil is well drained and nearly level. It is on alluvial fans. It formed in alluvium derived from weathered basic igneous rock Slopes are smooth and simple. Areas of this map unit are irregular in shape and range from about 20 to 2,300 acres in size. The vegetation is mainly annual grasses and forbs Elevation ranges from 300 feet to 2,000 feet but is dominantly less than 850 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 225 to 300 days.

Typically, the surface layer is brown and dark reddish brown clay about 32 inches thick. The underlying material is dark reddish gray clay and sandy clay to a depth of 72 inches. The soil is calcareous below a depth of about 32 inches. Deep, wide cracks form in this soil when it is dry.

Included with this soil in mapping are a few small areas of Centerville clay, Clear Lake clay, and Seville clay. Also included are a few areas of soil that has a water table at a depth of 20 to 48 inches. This last soil is near the town of Strathmore. These included soils make up about 15 percent of the mapped acreage.

This Porterville soil has slow permeability and moderate to high available water capacity. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

Most areas of this soil are used for orchards and cultivated crops. Oranges, olives, plums, and cotton are the main crops. A few small areas are used for urban development.

This soil is suited to orchards and cultivated crops. The clay texture is the main limitation when this soil is cultivated. Traffic on the soil during wet periods should be avoided to prevent soil compaction. Cultivation is difficult if the soil is too dry or too wet. Proper tillage and maintaining crop residue on or near the surface help maintain soil tilth, fertility, and water infiltration. Irrigation water should be controlled to avoid saturating the soil, which may damage trees. Sprinkler and furrow irrigation are most suitable for orchards. Furrow irrigation is most suitable for cultivated crops.

This soil is poorly suited to building sites, roads and streets, and septic tank absorption fields. The soil has high clay content and slow permeability and cannot bear heavy loads The problems for building sites and roads and streets can be overcome by replacing the base material. The slow permeability of this soil is a severe problem for septic tank absorption fields. Use of individual sewage lagoons or community sewer systems should be considered if these areas are used for housing development.

This soil has capability unit IIs-5 (17), irrigated, and IVs-5 (17), nonirrigated. It has a Storie Index of 54.

148—Porterville clay, 2 to 9 percent slopes. This very deep soil is well drained and gently to moderately sloping. It is on alluvial fans. It formed in alluvium derived from weathered basic igneous rock. Slopes are smooth and simple. Areas of this map unit are irregular in shape and range from about 20 to 2,800 acres in size. In a few areas the soil is dissected by shallow drainageways. The vegetation is mainly annual grasses and forbs. Elevation ranges from 300 feet to 2,000 feet but is dominantely less than 850 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 225 to 300 days.

Typically, the surface layer is brown and dark reddish brown clay about 32 inches thick. The underlying material is dark reddish gray clay and sandy clay to a depth of 72 inches. The soil is calcareous below a depth of about 32 inches. Deep, wide cracks form in this soil when it is dry.

Included with this soil in mapping are a few areas of Centerville clay, Clear Lake clay, and Seville clay. Also included are a few areas of a soil that has a water table at a depth of 20 to 48 inches. These wet soils are near Strathmore. These included soils make up about 15 percent of the mapped acreage.

This Porterville soil has slow permeability and moderate to high available water capacity. Surface runoff is slow or medium, and the hazard of erosion is low or moderate. The effective rooting depth is 60 inches or more.

Most areas of this soil are used for orchards. The main crops are oranges and olives. A few areas are used as rangeland. A few small areas are used for urban development.

This soil is suited to orchards. The hazard of erosion on steeper slopes and the clay texture are the main limitations. Erosion can be controlled by farming across the slope. Orchards can be protected from erosion by maintaining all crop residue on or near the surface and using cover crops. A system for collecting excess water and conducting it in diversions or permanent grassed waterways to outlets may be necessary. Cultivation is difficult if the soil is too wet or too dry. Properly timed tillage and returning crop residue to the soil help maintain soil tilth, water infiltration, and prevent erosion. Sprinkler and drip irrigation systems are most suitable for orchards. Irrigation water should be properly managed to

prevent erosion and saturation of the soil, which may damage trees.

This soil is suited to use as rangeland. Soil compaction is the main problem. Compaction is less if the soil is grazed when the moisture content is less than field capacity. This soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is poorly suited to building sites, roads and streets, and septic tank absorption fields. The soil has high clay content and slow permeability and cannot bear heavy loads. These problems for building sites and roads and streets can be overcome by replacing the base material. A severe problem for septic tank absorption fields is the slow permeability of this soil. Use of individual sewage lagoons or community sewer systems should be considered if these areas are used for homesite development.

This soil is in capability unit IIIe-5 (17), irrigated, and IVe-5 (17), nonirrigated. It has a Storie Index of 51.

149—Porterville clay, 9 to 15 percent slopes. This very deep soil is well drained and strongly sloping. It is on alluvial fans. It formed in alluvium derived from weathered basic igneous rock. Slopes are smooth and simple. Areas of this map unit are irregular in shape and range from about 20 to 800 acres in size. In a few areas the soil is dissected by shallow drainageways. The vegetation is mainly annual grasses and forbs. Elevation ranges from 300 feet to 2,000 feet but is dominately less than 850 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 225 to 300 days.

Typically, the surface layer is brown and dark reddish brown clay about 32 inches thick. The underlying material is dark reddish gray clay and sandy clay to a depth of 72 inches. The soil is calcareous below a depth of about 32 inches. Deep, wide cracks form in this soil when it is dry

Included with this soil in mapping are a few areas of Centerville clay. Also included are a few areas of soils that have gravel, cobbles, or stones on the surface. These included soils make up about 10 percent of the mapped acreage.

This Porterville soil has slow permeability and moderate to high available water capacity. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 60 inches or more.

Most areas of this soil are used as rangeland. A few areas are used for orchards. The main crops are oranges and olives.

This soil is suited to rangeland. The hazard of erosion and soil compaction are the main problems. Erosion can be controlled by leaving adequate residue on the surface. Compaction is less if the grass is grazed when the moisture content of the soil is less than field capacity. This soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is suited to orchards. The moderate hazard of erosion and the clay texture are the main limitations. Erosion can be controlled by farming across the slope. Orchards can be protected from erosion by maintaining all crop residue on the surface and by using cover crops. A system to collect excess water including diversions, erosion control structures, and permanent grassed waterways may be necessary. Cultivation is difficult if the soil is too wet or too dry. Properly timed tillage and returning crop residue to the soil help maintain soil tilth, water infiltration, and prevent erosion. Sprinkler and drip irrigation systems are most suitable for orchards. Irrigation water should be properly managed to prevent erosion or saturation of the soil, which may damage trees.

This soil is poorly suited to building sites, roads and streets, and septic tank absorption fields. The soil has high clay content and slow permeability and cannot bear heavy loads. The problems for building sites and roads and streets can be overcome by replacing the base material. A severe problem for septic tank absorption fields is the slow permeability of this soil. Use of community sewer systems should be considered on this soil if it is used for housing development.

This soil is in capability unit IVe-5 (17), irrigated and nonirrigated. It has a Storie Index of 48.

150—Porterville cobbly clay, 2 to 15 percent slopes. This very deep soil is well drained and gently to strongly sloping. It is on alluvial fans. It formed in alluvium derived from weathered basic igneous rock. Slopes are smooth and simple. Areas of this map unit are irregular in shape and range from about 20 to 600 acres in size. In many areas the soil is dissected by shallow drainageways. The vegetation is mainly annual grasses and forbs. Elevation ranges from 300 feet to 2,000 feet, but it is mainly less than 1,000 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 225 to 300 days.

Typically, the surface layer is brown cobbly clay about 7 inches thick. The underlying material is dark reddish brown, brown, and light brown clay to a depth of 69 inches. The soil is calcareous below a depth of about 7 inches. Deep, wide cracks form in this soil when it is dry.

Included with this soil in mapping are a few areas of Centerville clay and Porterville clay. These included soils make up about 10 percent of the mapped acreage.

This Porterville soil has slow permeability and moderate to high available water capacity. Surface runoff is slow or medium, and the hazard of erosion is slight or moderate. The effective rooting depth is 60 inches or more.

Most areas of this soil are used as rangeland. A few small areas are used for orchards. Oranges are the main crop.

This soil is suited to rangeland. Cobbles on the surface, hazard of erosion on the steeper slopes, and soil compaction are the main problems. Cobbles on the surface reduce yields of forage plants by about 25 percent. The hazard of erosion can be controlled by leaving adequate residue on the surface. Compaction is less if the soil is grazed when the moisture content is less than field capacity. This soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is suited to orchards. The limitations are the moderate hazard of erosion on steeper slopes, the clay texture, and the cobbly surface layer. Erosion can be controlled by farming across the slope. Orchards can be protected from erosion by maintaining all crop residue on or near the surface and using cover crops. A system to collect excess water, including diversions, erosion control structures, and permanent grassed waterways, may be necessary. The cobbles in the surface layer make cultivation very difficult. The clay texture also makes cultivation difficult if the soil is too wet or too dry. Properly timed tillage and returning crop residue to the soil help maintain soil tilth and water infiltration and help control erosion. Sprinkler and drip irrigation systems are most suitable for orchards. Irrigation water should be properly managed to prevent erosion and saturation of the soil, which may damage trees.

This soil is poorly suited to building sites, roads and streets, and septic tank absorption fields. The soil has high clay content and slow permeability and cannot bear heavy loads The problems for building sites and roads and streets can be overcome by replacing the base material. A severe problem for septic tank absorption fields is the slow permeability of this soil. Use of community sewer systems should be considered if these areas are used for housing development.

This soil is in capability unit IVs-5 (17), irrigated and nonirrigated, and has a Storie Index of 32.

151—Riverwash. This miscellaneous area consists of deep sand and gravel. These areas are adjacent to rivers and many of the small intermittent streams. The areas include dry riverbeds, low stream channels, or small islands within the stream channels. At normal high water, parts of these areas are inundated. Under flood conditions, nearly all are flooded. At present, however, floods on the Kaweah and Tule Rivers are generally controlled by large dams.

Some of this miscellaneous land area consists of smooth sandbars In other parts intermingled gravel, cobblestones, and stones are heaped into low ridges that separate sandy stringers. Many of the large areas include Honcut sandy loam and Tujunga sand.

Generally, Riverwash does not have vegetative cover, but in a few places there are scattered willows, cottonwoods, and sycamores and some brushy plants. Except for the included soils, this miscellaneous area has little value for grazing and no value for farming, but it is valuable as a source of sand and gravel.

This miscellaneous area is in capability class VIII and has a Storie Index rating of less than 10.

152—Rock outcrop. This miscellaneous area consists of exposures of hard bedrock that covers 90 percent or more of the surface. These areas are scattered throughout the lower and upper foothills in the soil survey area. They are mainly exposures of granitic, gabbro, and mica schist rocks. The small areas between the Rock outcrops consists of soils, and the vegetation is annual grasses and forbs and mixed trees and brush.

This miscellaneous area has no value for agriculture.

This miscellaneous area is in capability class VIII and has a Storie Index rating of less than 10.

153—San Emigdio loam. This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from mica schist and weathered granitic sources. Slope ranges from 0 to 2 percent. Slopes are smooth and simple. Areas of this map unit are irregular in shape and range from about 10 to 1,000 acres in size. The vegetation is mainly annual grasses and forbs. Elevation ranges from 300 feet to 600 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 225 to 280 days.

Typically, the surface layer is pale brown loam about 10 inches thick. The underlying material is brown and grayish brown loam and fine sandy loam to a depth of 66 inches. The soil is calcareous throughout. In a few areas the surface layer is sandy loam or fine sandy loam.

Included with this soil in mapping are a few small areas of Honcut sandy loam, Tujunga sand, and Wyman loam. Adjacent to Cottonwood and Yokohl Creeks, small areas of soil have more salts than the San Emigdio soils. In small areas west of the town of Porterville, the soil has a subsoil of pale brown heavy clay loam. These included soils make up about 10 percent of the mapped acreage.

This San Emigdio soil has moderately rapid permeability and high available water capacity. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

Most areas of this soil are used for orchards and cultivated crops. Oranges and cotton are the main crops. A few small areas are used for rangeland and urban development.

This soil is well suited to orchards and cultivated crops. It has few limitations when farmed. Proper tillage and maintaining crop residue on or near the surface help maintain soil tilth, water infiltration, and fertility. Furrow, sprinkler, and drip irrigation systems are most suited to orchards. Furrow irrigation is most suitable for cultivated crops.

This soil is suited to rangeland and has few limitations. It responds well to fertilizer and seeding. It is well suited to the production of soft chess, saltgrass, filaree, and burclover.

This soil is well suited to building sites and septic tank absorption fields. It is moderately suited to roads and streets. The main problem is that the soil cannot bear heavy loads. This can be corrected by replacing the base material

This soil is in capability class I (17), irrigated, and capability unit IVc-1 (17), nonirrigated. It has a Storie Index of 90.

154—San Joaquin loam, 0 to 2 percent slopes. This well drained, nearly level soil is moderately deep to a hardpan. It formed on terraces in alluvium derived from weathered granitic sources. Slopes are smooth and simple. Areas are irregular in shape and range from about 20 to 2,000 acres in size. The vegetation is annual grasses and forbs. Elevation ranges from 300 feet to 500 feet. The mean annual precipitation is about 12 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 250 to 300 days.

Typically, the surface layer is brown and reddish brown loam about 13 inches thick. The subsoil is reddish brown sandy clay loam and clay about 12 inches thick. Below the subsoil is a yellowish red hardpan about 31 inches thick. Below the hardpad is brown, stratified sandy loam and loam to a depth of 78 inches. In a few areas the surface layer is sandy loam.

Included with this soil in mapping are a few small areas of Exeter loam and Wyman loam. The Wyman soils are on small alluvial fans and are in low positions in the landscape. Also included with this soil are small areas of a soil that has a subsoil of brown clay loam or clay. Where the hardpan has been ripped, the surface layer and subsoil are mixed, and they generally contain many angular hardpan fragments the size of cobbles and gravel. Some areas of this San Joaquin soil are very shallow because of smoothing or leveling. These disturbed San Joaquin soils are also included in mapped areas. North of the town of Orosi and near the northeastern boundary of the survey area are small areas of a soil that has a subsoil of dark gray and dark brown clay over a strongly cemented hardpan and a soil that has a surface layer of brown sandy loam or loam and a subsoil of brown clay but does not have a hardpan. Another included soil has a surface layer of brown sandy loam and a subsoil of brown or reddish brown sandy clay loam but does not have a hardpan. These included soils make up 25 percent of the mapped acreage.

This San Joaquin soil has very slow permeability in the subsoil and in the hardpan. Where the hardpan has been ripped to a depth of 60 inches, the available water capacity is moderate. It is low where the hardpan has not been ripped. Surface runoff is slow, and the hazard of erosion is slight. Where the hardpan has not been ripped, the effective rooting depth is 20 to 40 inches. It is 40 inches or more where the hardpan has been ripped.

Most areas of this soil are used for orchards, vineyards, and cultivated crops. Oranges, olives, plums, table grapes, and cotton are the main crops A few small areas are used for urban development.

This soil is suited to orchards, vineyards, and cultivated crops. The main limitation of this soil is the hardpan, which restricts root growth Normally the hardpan is ripped and shattered to increase the effective rooting depth (fig. 4 and 5). This creates more even depth and better internal drainage. Proper tillage and returning crop residue to the soil help maintain soil tilth, water infiltration, and fertility Sprinkler and drip irrigation systems are most suitable for orchards Furrow irrigation is most suitable for vineyards and cultivated crops. Irrigation water should be properly managed to prevent waterlogging or a perched water table.

This soil is poorly suited to building sites, roads and streets, and septic tank absorption fields. The soil has high clay content, very slow permeability in the lower part of the subsoil, and a cemented hardpan. It also cannot bear heavy loads. These problems for building sites and roads and streets can be overcome by replacing the base material. Severe problems for septic tank filter fields are the very slow permeability of the lower part of the subsoil and the cemented hardpan. Onsite evaluation is needed to determine the method of sewage disposal.

This soil is in capability unit IIIs-3 (17), irrigated, and IVs-3 (17), nonirrigated. It has a Storie Index of 28.

155—San Joaquin loam, 2 to 9 percent slopes. This well drained, undulating and gently rolling soil is moderately deep to a hardpan. It formed on terraces in alluvium derived from weathered granitic sources. In some places the surface is fairly smooth, but in others it is hummocky. Areas of this map unit are irregular in shape and range from about 20 to 1,500 acres in size. In a few areas the soil is dissected by shallow drainageways. The vegetation is annual grasses and forbs. Elevation ranges from 300 feet to 500 feet. The mean annual precipitation is about 12 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 250 to 300 days.

Typically, the surface layer is brown and reddish brown loam about 13 inches thick. The subsoil is reddish brown sandy clay loam and clay about 12 inches thick. Below the subsoil is a yellowish red hardpan about 31 inches thick. Below the hardpan is brown, stratified sandy loam and loam to a depth of 78 inches. In a few areas the surface layer is sandy loam.

Included with this soil are small areas of Exeter loam and Wyman loam. The Wyman soils are on small alluvial fans and are in low positions in the landscape. Also included with this soil are small areas of a similar soil that has a subsoil of brown clay loam or clay. Also included are small areas of a soil that has a surface layer of brown sandy loam and a subsoil of brown clay but does not have a hardpan. This soil is in an area north of the town of Orosi, near the northeastern

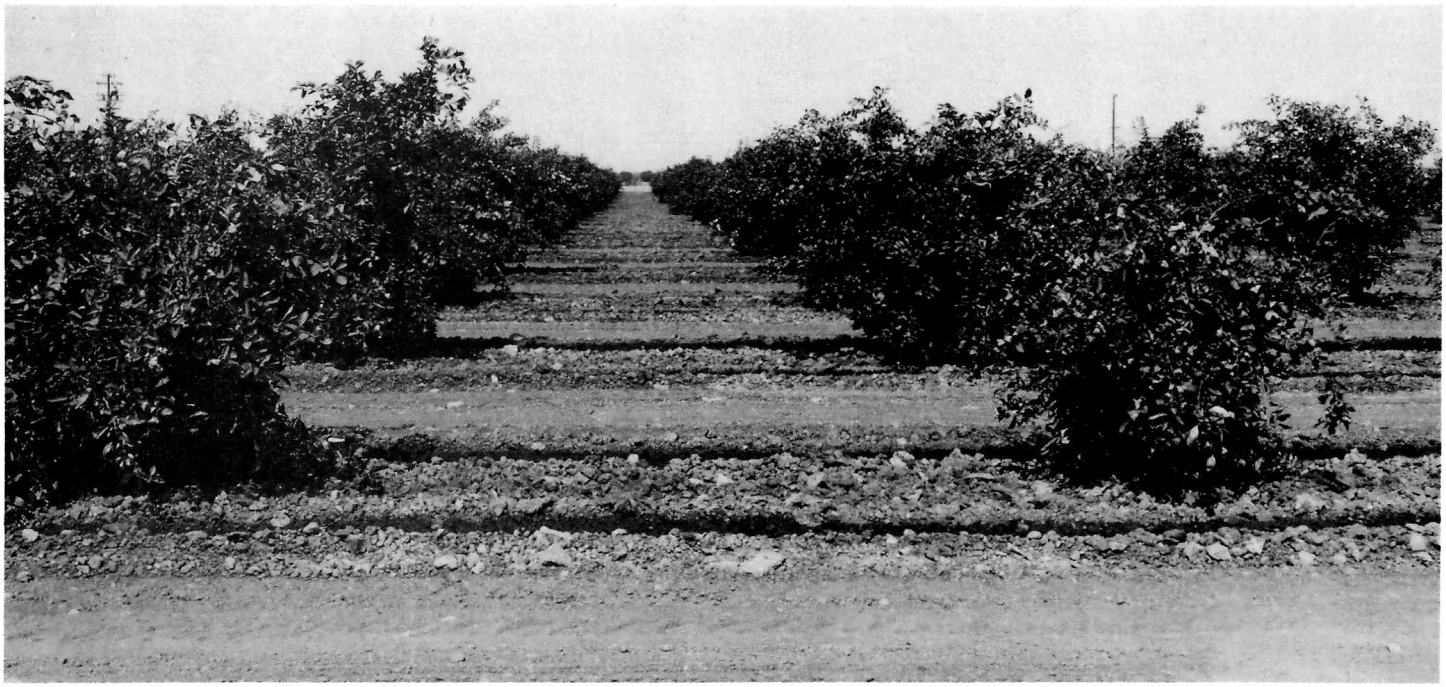


Figure 4.—A young orange grove on San Joaquin loam, 0 to 2 percent slopes. The hardpan in this soil has been ripped Fragments of the hardpan are on the surface

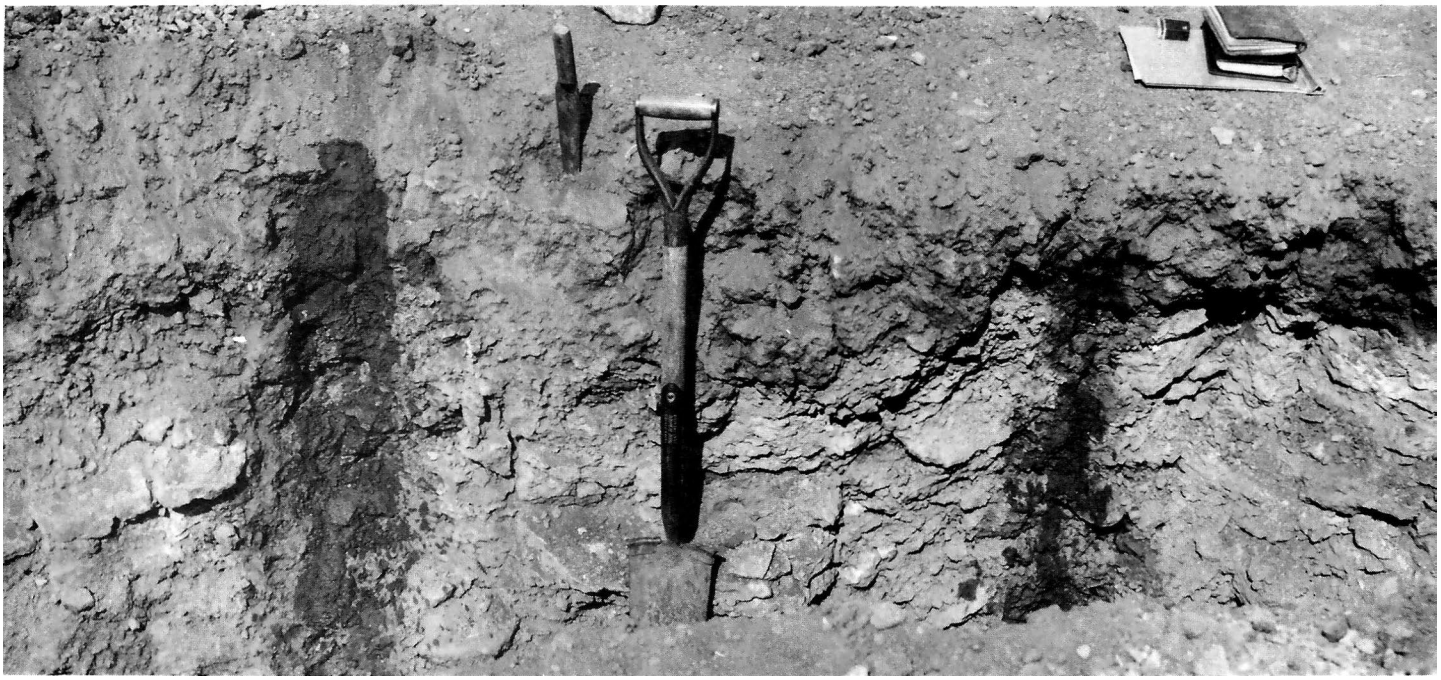


Figure 5—A pit dug in San Joaquin loam, 0 to 2 percent slopes, after it has been ripped and leveled

boundary of the survey area. These included soils make up about 20 percent of the mapped acreage.

This San Joaquin soil has very slow permeability in the subsoil and in the hardpan. The available water capacity is low to moderate. Surface runoff is slow or medium, and the hazard of erosion is slight or moderate. The effective rooting depth is 20 to 40 inches.

Most areas of this soil are used for cultivated crops and as rangeland. A few small areas are used for orchards. Nonirrigated wheat, oranges, and olives are the main crops. Expected yields from nonirrigated wheat is about 15 bushels per acre. A few small areas are used for urban development.

This soil is suited to cultivated crops and orchards. The main limitations are the hardpan and the moderate hazard of erosion on steeper slopes. Commonly the hardpan is ripped and shattered to increase the effective rooting depth and aid in internal drainage. Erosion can be controlled by farming across the slope and maintaining crop residue on or near the surface during periods of rainfall. After nonirrigated wheat, the soil should lie in fallow for 1 year and it should be minimum tilled to conserve moisture and prevent erosion. Proper tillage and returning crop residue to the soil help maintain soil tilth, water infiltration, and fertility. A system for collecting excess water and conducting it in diversions or permanent grassed waterways to outlets may be necessary to prevent erosion in cultivated crops and orchards. Orchard trees can be protected from erosion by maintaining all crop residue on or near the surface and by using cover crops. Sprinkler and drip irrigation systems are most suitable for orchards. Irrigation water should be properly managed to prevent erosion, waterlogging, or a perched water table.

This soil is suited to use as rangeland. Erosion hazard is a slight limitation. Erosion can be controlled by leaving adequate residue on the surface. The soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, filaree, and burclover.

This soil is poorly suited to building sites, roads and streets, and septic tank absorption fields. The soil has high clay content, very slow permeability in the lower part of the subsoil, and a cemented hardpan. The soil also cannot bear heavy loads. These problems for building sites and roads and streets can be overcome by replacing the base material. The very slow permeability in the lower part of the subsoil and the cemented hardpan are severe problems for septic tank absorption fields. Onsite evaluation is needed to determine the method of sewage disposal

This soil is in capability unit IIIe-3 (17), irrigated, and IVe-3 (17), nonirrigated. It has a Storie Index of 27.

156—Sesame sandy loam, 9 to 15 percent slopes. This moderately deep soil is well drained and rolling. It is on rounded knolls and uneven side slopes in the lower Sierra Nevada foothills. It formed in residual material weathered from granitic rock. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 10 to 150 acres in size. The vegetation is annual grasses and forbs and a few, scattered hardwood trees. Elevation ranges from 300 feet to 2,000 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 225 to 300 days.

Typically, the surface layer is dark grayish brown sandy loam about 9 inches thick. The subsoil is brown sandy clay loam about 22 inches thick. Below the subsoil is strongly weathered granitic rock.

Included with this soil in mapping are a few areas of Blasingame sandy loam, Coarsegold loam, and Vista coarse sandy loam. Also included are a few small areas of a soil that is similar to Sesame soil but formed in residual material of gabbro and a few areas of Sesame soil that has slope of more than 15 percent. These included soils make up about 15 percent of the mapped acreage.

This Sesame soil has moderate permeability and low to moderate available water capacity. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 20 to 40 inches.

This soil is used for rangeland and is suited to this use. It has few limitations when used for grazing. It responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is moderately suited to building sites and roads and streets. The steepness of slope and moderately high clay content in the subsoil are the main problems. Steep banks should be stabilized to prevent erosion. Topsoil can be stockpiled and used to reclaim areas that have been disturbed by cutting and filling. The moderately high clay content in the subsoil can cause foundations and roads to fail. This can be corrected by replacing the base material. Roads and streets built on the contour help to control runoff. The main problems for septic tank absorption fields are depth of soil to rock and moderate permeability in the subsoil. Effluent from the absorption field can surface in lower lying areas. Onsite evaluation is needed to determine the method of sewage disposal.

This soil is in capability unit IVe-1 (18), irrigated and nonirrigated. It has a Storie Index of 38.

157—Sesame sandy loam, 15 to 30 percent slopes. This moderately deep soil is well drained and hilly. It is on rounded knolls and uneven side slopes in the lower Sierra Nevada foothills. It formed in residual material weathered from granitic rock. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 20 to 2,000 acres in size. The vegetation is annual grasses and forbs and a few scattered hardwood trees. Elevation ranges from 300 feet to 2,000 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is

about 61 degrees F. The average frost-free season ranges from 225 to 300 days.

Typically, the surface layer is dark grayish brown sandy loam about 9 inches thick. The subsoil is brown sandy clay loam about 22 inches thick. Below the subsoil is strongly weathered granitic rock.

Included with this soil in mapping are a few areas of Blasingame sandy loam, Coarsegold loam, and Vista coarse sandy loam. Also included are a few small areas of a soil that is similar to this Sesame soil but formed in residual material of gabbro and a few small areas of soil that formed in residual material of slate. This latter soil is in an area east of the town of Porterville. There are a few areas of Sesame soil that has slope of more than 30 percent. These included soils make up about 20 percent of the mapped acreage.

This Sesame soil has moderate permeability and low to moderate available water capacity. Surface runoff is rapid, and the hazard of erosion is moderate or high. The effective rooting depth is 20 to 40 inches.

This soil is used as rangeland and is suited to this use. The hazard of erosion is the main problem. Erosion can be controlled by leaving adequate residue on the surface. The soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is poorly suited to urban devlopment. Steepness of slope and depth of soil are the main problems for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIe (18), nonirrigated, and has a Storie Index of 29.

158—Sesame sandy loam, 30 to 50 percent slopes. This moderately deep soil is well drained and steep. It is on rounded knolls and uneven side slopes in the lower Sierra Nevada foothills. It formed in residual material weathered from granitic rock. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 20 to 200 acres in size. The vegetation is annual grasses and forbs and a few, scattered hardwood trees. Elevation ranges from 300 to 2,000 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 225 to 300 days.

Typically, the surface layer is dark grayish brown sandy loam about 9 inches thick. The subsoil is brown sandy clay loam about 22 inches thick. Below this is strongly weathered granitic rock.

Included with this soil in mapping are a few small areas of Blasingame sandy loam, Coarsegold loam, and Vista coarse sandy loam Also included are a few small areas of a soil which is similar to this Sesame soil but which formed in residual material of gabbro and a few small areas of soil that formed in residual material of slate. This latter soil is in an area east of the town of Porterville There are a few areas of Sesame soil that has slope of more than 50 percent. These included areas make up about 20 percent of the mapped acreage.

This Sesame soil has moderate permeability and low to moderate available water capacity. Surface runoff is rapid, and the hazard of erosion is moderate or high. The effective rooting depth is 20 to 40 inches.

This soil is used as rangeland and is suited to this use. It is limited for this use mainly by the steepness of slope. Because steepness of slope limits access by livestock, the less sloping soils are overgrazed. Trails or walkways are needed to encourage livestock to graze on the steeper slopes. Soft chess, wild oats, burclover, and filaree are the main forage plants.

This soil is poorly suited to urban development. Steepness of slope and depth of soil to rock are the main problems for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIe (18), nonirrigated, and has a Storie Index of 18.

159—Seville clay. This well drained soil is moderately deep to a hardpan. It formed on fans in alluvium derived from weathered basic igneous sources. Slope ranges from 0 to 2 percent. Slopes are smooth and simple. Areas are irregular in shape and range from about 20 to 700 acres in size. The vegetation is mainly annual grasses and forbs. Elevation ranges from 300 feet to 500 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 250 to 300 days.

Typically, the surface layer is brown clay about 9 inches thick. The underlying material is dark reddish gray and reddish brown clay to a depth of 38 inches. The next layer is a light reddish brown hardpan about 14 inches thick. Below this is reddish brown sandy clay loam to a depth of 62 inches. The soil is calcareous below a depth of about 9 inches.

Included with this soil in mapping are a few small areas of Centerville clay and Porterville clay. Also included are a few small areas of a soil that is similar to this Seville soil but has slope of more than 2 percent. These included soils make up about 10 percent of the mapped acreage.

This Seville soil has slow permeability and low to moderate available water capacity. Surface runoff is very slow, and the hazard of erosion is slight. Where the hardpan has not been ripped, the effective rooting depth is 20 to 40 inches. Where the hardpan has been ripped, the effective rooting depth is 40 inches or more, depending on the depth of the ripping.

This soil is used for orchards, vineyards, and cultivated crops. Oranges, olives, plums, table grapes, cotton, and tomatoes are the main crops. Expected yields from tomatoes is about 22 tons per acre.

This soil is suited to orchards, vineyards, and cultivated crops. The main limitations of this soil are the

clay texture and the hardpan. Cultivation is difficult if the soil is too wet or too dry. Proper tillage and maintaining crop residue on or near the surface help maintain soil tilth, water infiltration, and fertility. Traffic on the soil during wet periods should be avoided to prevent soil compaction. The hardpan can be ripped to create a deeper and more effective rooting depth. Sprinkler and drip irrigation systems are well suited to orchards. Furrow irrigation is suitable for vineyards and cultivated crops. Irrigation water should be properly managed to avoid saturating the soil, which may damage orchard trees, vines, and cultivated crops.

This soil is poorly suited to building sites, roads and streets, and septic tank absorption fields. The soil has high clay content, slow permeability, and a cemented hardpan. It cannot bear heavy loads. The high clay content can cause foundations and roads to fail. This can be corrected by replacing the base material. Severe problems for septic tank filter fields are the slow permeability and the cemented hardpan. Onsite evaluation is needed to determine the method of sewage disposal.

This soil is in capability unit IIIs-5 (17), irrigated, and IVs-5 (17), nonirrigated. It has a Storie Index of 42.

160—Sheephead-Rock outcrop complex, 15 to 75 percent slopes. This hilly to very steep soil and Rock outcrop are on ridges and uneven side slopes in the upper Sierra Nevada foothills. Areas of this map unit are irregular in shape and range from about 200 to 2,000 acres in size. In many areas the soil is dissected by deep drainageways. The vegetation is shrubs, a few scattered conifers, and a small amount of annual grasses and forbs. Elevation ranges from 3,500 feet to 6,000 feet. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 55 degrees F. The average frost-free season ranges from 150 to 200 days.

This complex is about 50 percent Sheephead soil and about 30 percent Rock outcrop.

Included in mapping are a few small areas of Cieneba coarse sandy loam, Crouch coarse sandy loam, Friant fine sandy loam, and Holland loam. Also included are small areas of a soil that has slightly more clay in the subsoil. On the steeper slopes are small areas of soil that is moderately eroded. These included soils make up 20 percent of the mapped acreage.

Sheephead soil is shallow and well drained. It formed in residual material weathered from granodiorite.

Typically, the surface layer is dark grayish brown coarse sandy loam about 11 inches thick. The next layer is pale brown coarse sandy loam about 7 inches thick. Below this is very pale brown, strongly weathered granodiorite. In a few areas the surface layer is sandy loam.

This Sheephead soil has moderately rapid permeability and very low available water capacity. Surface runoff is rapid or very rapid, and the hazard of erosion is high or very high. The effective rooting depth is 10 to 20 inches.

Rock outcrop is hard granodiorite. These areas range from 4 to 300 feet in diameter to 10 acres. Rock outcrop is impermeable, so vegetative growth is limited to fractures in the rock structure. Surface runoff is very rapid, and there is no hazard of erosion.

This complex is used for rangeland; however, this Sheephead soil is poorly suited to this use. This soil is limited mainly by shallow depth to rock, limited rooting depth, or moderately coarse texture. The results of these limitations are very low available water capacity. Plant cover can easily deteriorate if overgrazed or mismanaged. Proper stocking rates should be maintained to obtain optimum production of vegetation. Deterioration of plant cover can result in extensive erosion. Mountain brome, blue wildrye, and ceanothus are the main forage and browse plants. Uniform grazing is hindered in areas that are covered by rock outcrop and have steep slope.

This complex is poorly suited to urban development. Steepness of slope, Rock outcrop, and shallow depth to bedrock are the main limiting features for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIs (22), nonirrigated. It has a Storie Index of 6.

161—Trabuco loam, 15 to 30 percent slopes. This deep soil is well drained and hilly. It is on uneven side slopes in the lower Sierra Nevada foothills. It formed in residual material weathered from gabbro. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 20 to 200 acres in size. Many areas are dissected by drainageways. The vegetation is annual grasses and forbs and a few shrubs and hardwood trees. The shrubs and hardwood trees become more dense on the north-facing slopes and at higher elevations. Elevation ranges from 1,200 feet to 3,500 feet. The mean annual precipitation is about 22 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 150 to 260 days.

Typically, the surface layer is brown loam about 8 inches thick. The subsoil is reddish brown and brown clay loam and clay about 34 inches thick. Below the subsoil is strongly weathered gabbro.

Included with this soil in mapping are a few small areas of Blasingame sandy loam, Coarsegold loam, and Las Posas loam. A few areas of Trabuco soil that has slope of more than 30 percent are also included. These included soils make up about 20 percent of the mapped acreage.

This Trabuco soil has slow permeability and moderate to high available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 40 to 60 inches.

This soil is used as rangeland and is suited to this use. The hazard of erosion and the clay subsoil are the main problems. Erosion can be controlled by leaving adequate residue on the surface. During periods of heavy rainfall,

this soil is subject to waterlogging. During these periods vegetation should not be grazed because the soil compacts. Woody plants at the higher elevations and on north-facing slopes are a problem in some places. If this soil is cleared of woody plants to create open areas, it produces a good stand of desirable grasses and forbs. This soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, filaree, and birchleaf mountainmahogany.

This soil is poorly suited to urban development. Steepness of slope, depth to rock, and high clay content in the subsoil are the main problems for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIe (18), nonirrigated, and has a Storie Index of 42.

162—Trabuco loam, 30 to 50 percent slopes. This deep soil is well drained and steep. It is on uneven side slopes in the lower Sierra Nevada foothills. It formed in residual material weathered from gabbro. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 20 to 500 acres in size. In many areas this soil is dissected by deep drainageways. The vegetation is annual grasses and forbs and a few shrubs and hardwood trees. The shrubs and hardwood trees become more dense on the north-facing slopes and at higher elevations. Elevation ranges from 1,200 feet to 3,500 feet. The mean annual precipitation is about 22 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 150 to 260 days.

Typically, the surface layer is brown loam about 8 inches thick. The subsoil is reddish brown and brown clay loam and clay about 34 inches thick. Below the subsoil is strongly weathered gabbro.

Included with this soil in mapping are a few small areas of Blasingame sandy loam, Coarsegold loam, and Las Posas loam. A few areas of Trabuco soil that has slope of more than 50 percent are also included. These included soils make up about 20 percent of the mapped acreage.

This Trabuco soil has slow permeability and moderate to high available water capacity. Runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 40 to 60 inches.

This soil is used as rangeland and is suited to this use. It is limited for this use mainly by steepness of slope and clay subsoil. Because steepness of slope limits access by livestock, the less sloping soils are overgrazed. Trails or walkways are needed to encourage livestock to graze on the steeper slopes. During periods of heavy rainfall, this soil is subject to waterlogging. During these periods vegetation should not be grazed because the soil compacts. Woody plants at the higher elevations and on north-facing slopes are a problem in some places. If the woody plants are cleared to create open areas, this soil produces a good stand of desirable grasses and forbs. Soft chess, wild oats, filaree, and birchleaf mountainmahogany are the main forage and browse plants.

This soil is poorly suited to urban development. Steepness of slope, depth to rock, and high clay content in the subsoil are the main problems for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIe (18), nonirrigated, and has a Storie Index of 26.

163—Trabuco-Rock outcrop complex, 15 to 50 percent slopes. This hilly to steep soil and Rock outcrop are on uneven side slopes in the lower Sierra Nevada foothills. Areas of this map unit are irregular in shape and range from about 20 to 200 acres in size. In many areas this soil is dissected by drainageways. The vegetation is annual grasses and forbs and a few shrubs and scattered hardwood trees. The shrubs and hardwood trees become more dense on north-facing slopes and at higher elevations. Elevation ranges from 1,200 feet to 3,500 feet. The mean annual precipitation is about 22 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 150 to 260 days.

This complex is about 50 percent Trabuco soil and about 30 percent Rock outcrop.

Included in mapping are a few small areas of Blasingame sandy loam and Las Posas loam. Also included are a few areas of Trabuco soil that has slope of more than 50 percent. These included soils make up 20 percent of the mapped acreage.

Trabuco soil is deep and well drained. It formed in residual material weathered from gabbro.

Typically, the surface layer is brown loam about 8 inches thick. The subsoil is reddish brown and brown clay loam and clay about 34 inches thick. Below the subsoil is strongly weathered gabbro.

This Trabuco soil has slow permeability and moderate to high available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 40 to 60 inches.

Rock outcrop is hard gabbro. These areas range from 4 to 300 feet in diameter to 10 acres. Rock outcrop is impermeable, so vegetative growth is limited to fractures in the rock structure. Surface runoff is very rapid, and there is no hazard of erosion.

This complex is used for rangeland and is suited to this use. It is limited for this use mainly by Rock outcrop, steepness of slope, and clay subsoil. Uniform grazing is hindered by Rock outcrop and steep slope. During periods of heavy rainfall, this Trabuco soil is subject to waterlogging. During these periods the vegetation should not be grazed because the soil compacts. Plant cover can easily deteriorate if overgrazed or mismanaged. Proper stocking rates should be maintained to obtain optimum production of vegetation. Woody plants at the higher elevations and on north-facing slopes is a problem in some places. If the woody plants are cleared to create open areas, this soil produces a good stand of

desirable grasses and forbs. Soft chess, wild oats, filaree, and birchleaf mountainmahogany are the main forage and browse plants.

This complex is poorly suited to urban development. Steepness of slope, depth to rock, Rock outcrop, and a clay subsoil are the main limiting features for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIs (18), nonirrigated, and has a Storie Index of 18.

164—Tujunga sand. This very deep soil is somewhat excessively drained. It is on alluvial fans. It formed in alluvium derived from granitic sources. Slope ranges from 0 to 5 percent. Slopes are smooth and simple. Areas of this map unit are irregular in shape and range from about 10 to 600 acres in size. In a few areas the soil is dissected by shallow drainageways. The vegetation is mainly annual grasses and forbs. Elevation ranges from 300 feet to 2,500 feet, but it is mainly less than 1,000 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 225 to 300 days.

Typically, the surface layer is light brownish gray sand about 8 inches thick. The underlying material is grayish brown and very pale brown sand and coarse sand to a depth of 60 inches. In a few areas the surface layer is sandy loam or fine sandy loam.

Included with this soil in mapping are a few small areas of Honcut sandy loam and San Emigdio loam. Also included are small areas of a soil that is strongly calcareous at a depth of 20 to 60 inches. These included soils make up about 10 percent of the mapped acreage.

This Tujunga soil has rapid permeability and low available water capacity. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

Most areas of this soil are used as rangeland. A few areas are used for vineyards and orchards. Table grapes, olives, oranges, and walnuts are the main crops. A few small areas are used for urban development.

This soil is poorly suited to rangeland. It is limited for this use mainly by coarse texture and low available water capacity. Plant cover deteriorates readily if it is overgrazed. Soft chess, wild oats, and filaree are the main forage plants.

This soil is suited to vineyards and orchards. The main limitation of this soil is its rapid permeability and low available water capacity. Maintaining crop residue on or near the surface and using cover crops improve the available water capacity Sprinkler irrigation is the most suitable method of applying water. Water should be applied in amounts sufficient to wet the root zone but small enough to minimize leaching of plant nutrients.

This soil is well suited to urban development. It has few limitations for building sites, roads and streets, and septic tank absorption fields. Because of the rapid permeability, septic tank absorption fields should be located a sufficient distance away from domestic water wells to prevent contamination.

This soil is in capability unit IIIs-4 (17), irrigated, and capability subclass VIs (17), nonirrigated. It has a Storie Index of 54.

165—Vista coarse sandy loam, 9 to 15 percent slopes. This moderately deep soil is well drained and rolling. It is on ridges and uneven side slopes in the lower Sierra Nevada foothills. It is mainly on south-facing slopes. It formed in residual material weathered from quartz diorite. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 10 to 300 acres in size. In many areas the soil is dissected by shallow drainageways. The vegetation is annual grasses and forbs and a few shrubs and hardwood trees. Elevation ranges from 400 feet to 2,500 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 210 to 300 days.

Typically, the surface layer is pale brown coarse sandy loam about 10 inches thick. The subsoil is pale brown and light yellowish brown coarse sandy loam about 17 inches thick. Below the subsoil is moderately weathered quartz diorite. In a few areas the surface layer is sandy loam.

Included with this soil in mapping are a few small areas of Blasingame sandy loam, Cieneba coarse sandy loam, and Walong sandy loam. Also included with this soil are small areas of eroded soils near drainageways and a few areas of Vista soil that has slope of more than 15 percent. These included soils make up about 15 percent of the mapped acreage.

This Vista soil has moderately rapid permeability and very low to low available water capacity. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 20 to 40 inches.

Most areas of this soil are used as rangeland. In a few areas at the lower elevations, irrigation water is available and the frost hazard is low. These areas are used for orchards. Oranges and avocados are the main crop. A few small areas are used for urban development.

This soil is suited to rangeland. It has few limitations when used for grazing. It responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is moderately suited to orchards. The hazard of erosion on steep slopes is the main problem Minimum tillage and the use of cover crops help maintain fertility and water intake rate and help reduce erosion. A system for collecting and disposing of excess water from higher lying areas may be necessary to prevent severe erosion damage. Because of slope, sprinkler or drip irrigation systems are most suitable for orchards. The use of sprinkler or drip irrigation prevents soil erosion.

This soil is moderately suited to building sites and roads and streets. The steepness of slope is the main problem. Steep banks should be stabilized to prevent erosion. Topsoil can be stockpiled and used to reclaim areas that have been disturbed by cutting and filling. Roads and streets built on the contour help control runoff. The main problem for septic tank absorption fields is depth of the soil. Effluent from absorption areas can surface in lower lying areas. Onsite evaluation is needed to determine the best method of sewage disposal.

This soil is in capability unit IVe-1 (18), irrigated and nonirrigated, and has a Storie Index of 42.

166—Vista coarse sandy loam, 15 to 30 percent slopes. This moderately deep soil is well drained and hilly. It is on ridges and uneven side slopes in the lower Sierra Nevada foothills. It is mainly on south-facing slopes. It formed in residual material weathered from quartz diorite. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 20 to 300 acres in size. In many areas the soil is dissected by deep drainageways. The vegetation is annual grasses and forbs and a few shrubs and hardwood trees. Elevation ranges from 400 feet to 2,500 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 210 to 300 days.

Typically, the surface layer is pale brown coarse sandy loam about 10 inches thick. The subsoil is pale brown and light yellowish brown coarse sandy loam about 17 inches thick. Below the subsoil is moderately weathered quartz diorite. In a few areas the surface layer is sandy loam.

Included with this soil in mapping are a few small areas of Blasingame sandy loam, Cleneba coarse sandy loam, and Walong sandy loam. Also included with this soil are small areas of eroded soils near drainageways and a few areas of Vista soil that has slope of more than 30 percent. These included soils make up about 15 percent of the mapped acreage.

This Vista soil has moderately rapid permeability and very low to low available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 20 to 40 inches.

Most areas of this soil are used as rangeland. In a few areas at the lower elevations, irrigation water is available and the frost hazard is low. These areas are used for orchards. Oranges and avocados are the main crops. A few small areas are used for urban development.

This soil is suited to rangeland. The hazard of erosion is the main problem. Erosion can be controlled by leaving adequate residue on the surface. This soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree

This soil is moderately suited to orchards. The hazard of erosion on steep slopes is the main problem when the soil is used for orchards. Minimum tillage and use of cover crops help maintain fertility and water intake rate and help reduce erosion. A system for collecting and dispersing excess water from higher lying areas may be necessary to prevent severe erosion damage. Because of slope, drip irrigation is the most suitable for orchards. The use of drip irrigation prevents soil erosion.

This soil is poorly suited to urban development. Steepness of slope and depth of soil to rock are the main problems for building sites, roads and streets, and septic tank absorption fields. Onsite investigation may indicate small isolated areas that are suitable for homesites.

This soil is in capability subclass VIe (18), nonirrigated, and has a Storie Index of 32.

167—Vista coarse sandy loam, 30 to 50 percent slopes. This moderately deep soil is well drained and steep. It is on ridges and uneven side slopes in the lower Sierra Nevada foothills. It is mainly on south-facing slopes. It formed in residual material weathered from quartz diorite. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 30 to 1,000 acres in size. In many areas the soil is dissected by deep drainageways. The vegetation is annual grasses and forbs and a few shrubs and hardwood trees. Elevation ranges from 400 feet to 2,500 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 210 to 300 days.

Typically, the surface layer is pale brown coarse sandy loam about 10 inches thick. The subsoil is pale brown and light yellowish brown coarse sandy loam about 17 inches thick. Below the subsoil is moderately weathered quartz diorite. In a few areas the surface layer is sandy loam.

Included with this soil in mapping are a few small areas of Blasingame sandy loam, Cleneba coarse sandy loam, and Walong sandy loam. Also included with this soil are small areas of eroded soils near drainageways and a few areas of Vista soil that has slope of more than 50 percent. These included soils make up about 20 percent of the mapped acreage.

This Vista soil has moderately rapid permeability and very low to low available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 20 to 40 inches.

This soil is used as rangeland and is suited to this use. It is limited for this use mainly by the steepness of slope. Because steepness of slope limits access by livestock, the less sloping soils are overgrazed. Trails or walkways are needed to encourage livestock to graze on the steeper slopes. Soft chess, wild oats, burclover, and filaree are the main forage plants.

This soil is poorly suited to urban development. Steepness of slope and depth of soil to rock are the main problems for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIe (18), nonirrigated, and has a Storie Index of 19

168—Vista-Rock outcrop complex, 9 to 50 percent slopes. This rolling to steep soil and Rock outcrop are on uneven side slopes in the lower Sierra Nevada foothills. (fig. 6). It is dominantely on south-facing slopes. Areas of this map unit are irregular in shape and range from about 30 to 1,500 acres in size. In many areas the soil is dissected by deep drainageways. The vegetation is annual grasses and forbs and a few shrubs and hardwood trees. Elevation ranges from 400 feet to 2,500 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 210 to 280 days.

This complex is about 55 percent Vista soil and about 25 percent Rock outcrop.

Included in mapping are a few small areas of Blasingame sandy loam, Cleneba coarse sandy loam, and Walong sandy loam. Also included with this soil are small areas of eroded soils near drainageways and a few areas of Vista soil that has slope of more than 50 percent. These included soils make up 20 percent of the mapped acreage.

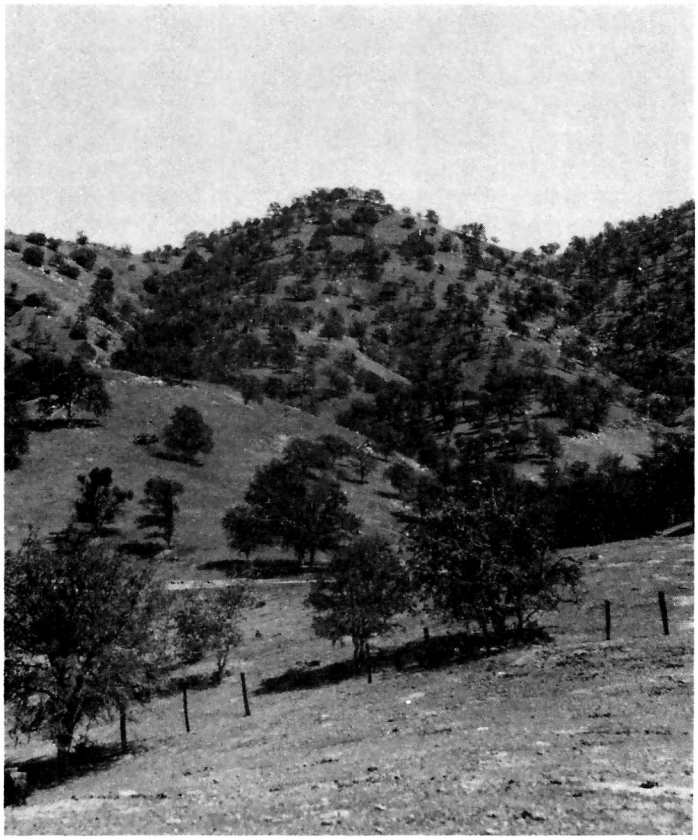


Figure 6—Typical landscape and native vegetation of the Vista soils.

The Vista soil is moderately deep and well drained. It formed in residual material weathered from quartz diorite.

Typically, the surface layer is pale brown coarse sandy loam about 10 inches thick. The subsoil is pale brown and light yellowish brown coarse sandy loam about 17 inches thick. Below the subsoil is moderately weathered quartz diorite. In a few areas the surface layer is sandy loam.

This Vista soil has moderately rapid permeability and very low to low available water capacity. Surface runoff is medium or rapid, and the hazard of erosion is moderate or high. The effective rooting depth is 20 to 40 inches.

Rock outcrop is hard quartz diorite. These areas range from 2 to 200 feet in diameter to 10 acres. Rock outcrop is impermeable, so vegetative growth is limited to fractures in the rock structure. Surface runoff is very rapid, and there is no hazard of erosion.

This complex is used as rangeland, and the Vista soil is suited to this use. It is limited for this use mainly by moderately coarse texture. This results in low available water capacity. Plant cover can easily deteriorate if it is overgrazed or mismanaged. Uniform grazing is hindered by Rock outcrop and steep slope. Proper stocking rates should be maintained to obtain optimum production of vegetation. Deterioration of plant cover can result in extensive erosion. Soft chess, wild oats, burclover, and filaree are the main forage plants.

This complex is poorly suited to urban development. Steepness of slope, Rock outcrop, and depth of soil to rock are the main limiting features for building sites, roads and streets, and septic tank absorption fields. This soil should have onsite evaluation to determine urban uses.

This soil is in capability subclass VIIs (18), nonirrigated, and has a Storie Index of 12.

169—Walong sandy loam, 15 to 30 percent slopes. This moderately deep soil is well drained and hilly. It is on ridges and uneven side slopes in the lower Sierra Nevada foothills. It formed in residual material weathered from granitic rock. There is some outcropping of rock. Areas of this map unit are irregular in shape and range from about 20 to 200 acres in size. In many areas the soil is dissected by drainageways. The vegetation at the higher elevations and on north and east exposures are hardwood trees, shrubs, and annual grasses and forbs. The vegetation at the lower elevations and on west exposures are annual grasses, forbs, and a few hardwood trees and shrubs. Elevation ranges from 800 feet to 3,500 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 150 to 280 days.

Typically, the surface layer is grayish brown sandy loam about 13 inches thick. The subsoil is brown and

light yellowish brown sandy loam about 20 inches thick Below the subsoil is light yellowish brown, strongly weathered granitic rock In a few areas the surface layer is coarse sandy loam.

Included with this soil in mapping are a few small areas of Auberry sandy loam, Blasingame sandy loam, Cieneba coarse sandy loam, and Vista coarse sandy loam. Cieneba coarse sandy loam is mainly on ridges and south-facing slopes Also included is a sandy loam soil that has 3 to 5 percent more clay in the subsoil. This soil is near the north boundary of the soil survey area. Also included are small areas of a soil similar to the Walong soils except it is over weathered mica schist and a few areas of Walong soil that has slope of more than 30 percent. These included soils make up about 15 percent of the mapped acreage.

This Walong soil has moderately rapid permeability and very low to low available water capacity. The surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 20 to 40 inches.

This soil is used as rangeland and is suited to this use. The hazard of erosion is the main problem. Erosion can be controlled by leaving adequate residue on the surface. Woody plants at the higher elevations and on north-facing slopes are a problem in some places. If the woody plants are cleared to create open areas, this soil produces a good stand of desirable grasses and forbs. This soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, burclover, and filaree.

This soil is poorly suited to urban development Steepness of slope and depth of soil to rock are the main problems for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIe (18), nonirrigated, and has a Storie Index of 41.

170—Walong sandy loam, 30 to 50 percent slopes. This moderately deep soil is well drained and steep. It is on ridges and uneven slopes in the lower Sierra Nevada foothills. It formed in residual material weathered from granitic rock. There is some outcropping of rock. Areas of this map unit are irregular in slope and range from about 30 to 300 acres in size. In many areas this soil is dissected by deep drainageways. The vegetation at high elevations and on north and east exposures are hardwood trees, shrubs, and annual grasses and forbs. The vegetation at the low elevations and on west exposures are annual grasses and forbs and a few hardwood trees and shrubs. Elevation ranges from 800 feet to 3,500 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 150 to 280 days.

Typically, the surface layer is grayish brown sandy loam about 13 inches thick. The subsoil is brown and light yellowish brown sandy loam about 20 inches thick. Below the subsoil is light yellowish brown, strongly weathered granitic rock In a few areas the surface layer is coarse sandy loam.

Included with this soil in mapping are a few small areas of Auberry sandy loam, Blasingame sandy loam, Cieneba coarse sandy loam, and Vista coarse sandy loam Cieneba coarse sandy loam is mainly on ridges and south-facing slopes. Also included are small areas of a soil similar to the Walong soils except it is over weathered mica schist and a few areas of Walong soil that has slope of more than 50 percent. These included soils make up about 20 percent of the mapped acreage.

This Walong soil has moderately rapid permeability and very low to low available water capacity. The surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 20 to 40 inches.

This soil is used as rangeland and is suited to this use. It is limited for this use mainly by steepness of slope. Because steepness of slope limits access by livestock, the less sloping soils are overgrazed. Trails or walkways are needed to encourage livestock to graze on the steeper slopes. Woody plants at the higher elevations and on north-facing slopes are a problem in some places. If the woody plants are cleared to create open areas, this soil produces a good stand of desirable grasses and forbs. Soft chess, wild oats, burclover, and filaree are the main forage plants.

This soil is poorly suited to urban development. Steepness of slope and depth of soil to rock are the main problems for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIe (18), nonirrigated, and has a Storie Index of 25.

171—Walong-Rock outcrop complex, 15 to 50 percent slopes. This hilly to steep soil and Rock outcrop are on ridges and uneven side slopes in the lower Sierra Nevada foothills. Areas of this map unit are irregular in shape and range from about 50 to 1,500 acres in size. In many areas the soil is dissected by deep drainageways. The vegetation is annual grasses and forbs, shrubs, and hardwood trees. The shrubs and hardwood trees become more dense on north-facing slopes and at higher elevations. Elevation ranges from 800 feet to 3,500 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 150 to 280 days.

This complex is about 55 percent Walong soil and about 25 percent Rock outcrop.

Included in mapping are a few small areas of Auberry sandy loam, Blasingame sandy loam, Cieneba coarse sandy loam, and Vista coarse sandy loam Cieneba coarse sandy loam is mainly on ridges and south-facing slopes. Also included is a sandy loam soil that has 3 to 5 percent more clay in the subsoil. This latter soil is near the north boundary of the survey area. Also included are small areas of a soil that is similar to the Walong soils except it is over weathered mica schist and a few areas

of Walong soil that has slope of more than 50 percent. These included soils make up 20 percent of the mapped acreage.

The Walong soil is moderately deep and well drained. It formed in residual material weathered from granitic rock.

Typically, the surface layer is grayish brown sandy loam about 13 inches thick. The subsoil is brown and light yellowish brown sandy loam about 20 inches thick. Below the subsoil is light yellowish brown strongly weathered granitic rock. In a few areas the surface layer is coarse sandy loam.

This Walong soil has moderately rapid permeability and very low to low available water capacity. Surface runoff is rapid, and the hazard of erosion is high. The effective rooting depth is 20 to 40 inches.

Rock outcrop is hard granitic rock. These areas range from 4 to 200 feet in diameter to 10 acres. Rock outcrop is impermeable, so vegetative growth is limited to fractures in the rock structure. Surface runoff is very rapid, and there is no hazard of erosion.

This complex is used as rangeland, and this Walong soil is suited to this use. The soil is limited for this use mainly by its moderately coarse texture, which results in low available water capacity. Plant cover can easily deteriorate if overgrazed or mismanaged. Uniform grazing is hindered by rock outcrop and steep slope. Proper stocking rates should be maintained to obtain optimum production of vegetation. Deterioration of plant cover can result in extensive erosion. Woody plants at the higher elevations and on north-facing slopes are a problem in some places. If the woody plants are cleared to create open areas, this soil produces a good stand of desirable grasses and forbs. Soft chess, wild oats, burclover, and filaree are the main forage plants.

This complex is poorly suited to urban development. Steepness of slope, Rock outcrop, and depth of soil to rock are the main limiting features for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability subclass VIIs (18), nonirrigated, and has a Storie Index of 19.

172—Wyman loam, 0 to 2 percent slopes. This very deep soil is well drained and nearly level. It is on alluvial fans. It formed in mixed alluvium derived mainly from gabbro and mica schist. Slopes are smooth and simple. Most areas of this soil are southwest of the town of Lindsay and north of the town of Woodlake. Areas are irregular in shape and range from about 10 to 700 acres in size. The vegetation is mainly annual grasses and forbs. Elevation ranges from 300 feet to 2,500 feet but mainly are less than 850 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 225 to 300 days.

Typically, the surface layer is brown loam about 19 inches thick. The subsoil is brown loam, clay loam, and sandy clay loam about 50 inches thick. Below the subsoil yellowish brown sand extends to a depth of 75 inches.

Included with this soil in mapping are a few small areas of Exeter loam, Havala loam, and San Joaquin loam. The San Joaquin and Exeter soils are on terraces and at higher positions in the landscape. Also included are small areas of a soil that does not have a subsoil. These included soils make up about 15 percent of the mapped acreage.

This Wyman soil has moderately slow permeability and high available water capacity. Surface runoff is slow and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

Most areas of this soil are used for orchards and cultivated crops. Oranges, olives. plums, and cotton are the main crops. A few small areas are used for urban development.

This soil is well suited to orchards and cultivated crops. It has few limitations when it is farmed. Proper tillage and maintaining crop residue on or near the surface help maintain soil tilth, water infiltration, and fertility. Furrow, sprinkler, and drip irrigation systems are most suitable for orchards. Furrow irrigation is most suitable for cultivated crops.

This soil is moderately suited to building sites and roads and streets. The main problem is the moderately high clay content of the subsoil, which can cause foundations and roads to fail. This can be corrected by replacing the base material. The main problem for septic tank absorption fields is the moderately slow permeability of the subsoil. This can be corrected by increasing the size of the absorption area or by placing the leach lines in the sandy substratum.

This soil is in capability class I (17), irrigated, and capability unit IVc-1 (17), nonirrigated. It has a Storie Index of 95.

173—Wyman loam, 2 to 5 percent slopes. This very deep soil is well drained and gently sloping. It is on alluvial fans. It formed in mixed alluvium derived mainly from gabbro and mica schist. Slopes are smooth and simple. Most areas of this soil are southwest of the town of Lindsay and north of the town of Woodlake. Areas of this map unit are irregular in shape and range from about 10 to 300 acres in size. In a few areas the soil is dissected by shallow drainageways. The vegetation is mainly annual grasses and forbs. Elevation ranges from 300 feet to 2,500 feet but mainly is less than 850 feet. The mean annual precipitation is about 10 inches, and the mean annual temperature is about 63 degrees F. The average frost-free season ranges from 225 to 300 days.

Typically, the surface layer is brown loam about 19 inches thick. The subsoil is brown loam, clay loam, and sandy clay loam about 50 inches thick. Below the subsoil, yellowish brown sand extends to a depth of 75 inches.

Included with this soil in mapping are small areas of Exeter loam, Havala loam, and San Joaquin loam. The San Joaquin and Exeter soils are on terraces and at

higher positions in the landscape. Also included are small areas of a soil that does not have a subsoil and a few areas of Wyman soil that has slope of more than 5 percent. These included soils make up about 15 percent of the mapped acreage.

This Wyman soil has moderately slow permeability and high available water capacity. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

Most areas of this soil are used as rangeland. A few small areas are used for orchards. Olives are the main crop.

This soil is suited rangeland. Erosion hazard is slight; however, erosion can be controlled by leaving adequate residue on the surface. This soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, filaree, and burclover.

This soil is suited to orchards. Erosion is the main hazard on steeper slopes. Soil erosion can be controlled by farming across the slope and maintaining crop residue on or near the surface during periods of rainfall. Orchards can also be protected from erosion by using cover crops Proper tillage and returning crop residue to the soils help maintain soil tilth and water infiltration. Sprinkler and drip irrigation are most suitable for orchards.

This soil is moderately suited to building sites and roads and streets. The main problem is the moderately high clay content of the subsoil, which can cause foundations and roads to fail. This can be overcome by replacing the base material. The moderately slow permeability of the subsoil is the main problem for septic tank absorption fields. This can be corrected by increasing the size of the absorption area, or by placing the leach lines in the sandy substratum.

This soil is in capability unit IIe-1 (17) irrigated, and IVe-1 (17), nonirrigated. It has a Storie Index of 90.

174—Wyman gravelly loam, 0 to 2 percent slopes. This very deep soil is well drained and nearly level. It is on alluvial fans. It formed in mixed alluvium derived mainly from gabbro and mica schist. Slopes are smooth and simple. Only one area of this soil is mapped. It is located southwest of the town of Lindsay. It is irregular in shape and is 554 acres in size. The vegetation is mainly annual grasses and forbs Elevation ranges from 400 feet to 500 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 225 to 300 days.

Typically, the surface layer is brown gravelly loam about 16 inches thick. The subsoil is reddish brown gravelly sandy clay loam about 24 inches thick. Below the subsoil, reddish brown very gravelly sand extends to a depth of 60 inches.

Included with this soil in mapping are a few small areas of Exeter loam and San Joaquin loam. These included soils make up about 5 percent of the mapped acreage.

This Wyman soil has moderately slow permeability and low or moderate available water capacity. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

This soil is used for orchards. Oranges and olives are the main crops.

This soil is suited to orchards. The main limitation of this soil is the gravelly loam texture. The gravel reduces the available water capacity. Proper tillage and returning crop residue to the soil help maintain soil tilth, improve available water capacity, and fertility. Sprinkler and furrow irrigation systems are most suitable for orchards.

This soil is moderately suited to building sites and roads and street. The main problem is the moderately high clay content of the subsoil, which can cause foundations and roads to fail. This can be corrected by replacing the base material. The main problem for septic tank absorption fields is the moderately slow permeability of the subsoil. This can be corrected by increasing the size of the absorption area or by placing the leach lines in the sandy substratum.

This soil is in capability unit IIs-4 (17), irrigated, and IVs-4 (17), nonirrigated. It has a Storie Index of 66.

175—Xerofluvents, flooded. This deep soil is well drained to excessively drained. It is on recent alluvial fans. Slope ranges from 2 to 15 percent. Slopes are uneven and complex. Some areas are depressional. Most of this soil is northeast of Lake Kaweah and east and northeast of Lake Success, near the Kaweah and Tule Rivers. Small areas are near Dry Creek and Deer Creek. This soil formed in alluvium derived from mixed sources. Areas of this map unit are irregular in shape and range from about 20 to 1,200 acres in size. In many areas the soil is dissected by shallow to deep drainageways. The vegetation is shrubs and hardwood trees and annual grasses and forbs. Elevation ranges from 500 feet to 3,200 feet. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F. The average frost-free season ranges from 150 to 280 days.

This soil ranges in texture from sandy loam to silty clay loam. In some places it is gravelly or stony. In some areas large boulders are scattered on the surface.

Included with this soil are small areas of recent deposits of sand or coarse sand. Also included with this soil are small areas of a stony soil that has a surface layer of brown sandy loam, loam, or silt loam and a subsoil of reddish brown sandy clay loam or clay loam. These included soils make up about 25 percent of the mapped acreage.

This soil has moderately rapid to moderately slow permeability and moderate available water capacity. Surface runoff in most areas is slow or medium, but in a few places small ponds remain in depressions for a short period of time. Flooding of the higher areas is unlikely

but possible under abnormal conditions. In the lower areas near the stream channels, flooding is likely under normal conditions during the months of November through March The hazard of erosion is variable, depending upon the flood conditions There may be either additional deposition of soil material or the banks may be cut away.

This soil is used as rangeland and is suited to this use. It is limited mainly by flood hazard and boulders on the surface. Some areas are so rough and broken by stream channels that they provide little grazing. Shrubs and hardwood trees are the most extensive plants on this soil. Brush control generally is not economically feasible. The herbaceous plant cover deteriorates if it is overgrazed. Removal of plant cover may result in extensive erosion. Ceanothus, interior live oak, soft chess, redstem filaree, and burclover are the main browse and forage plants.

This soil is poorly suited to urban development. Flooding and stones and boulders on the surface are the main problems.

This soil is in capability subclass VIIw (18), nonirrigated. It has a Storie Index of 16-32.

176—Yettem sandy loam, 0 to 2 percent slopes. This very deep soil is well drained and nearly level. It is on alluvial fans. It formed in alluvium derived from granitic sources. Slopes are smooth and simple. Areas of this map unit are irregular in shape and range from about 10 to 850 acres in size. The vegetation is mainly annual grasses and forbs. Elevation ranges from 300 feet to 1,500 feet, but it is mainly less than 850 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 250 to 300 days.

Typically, the surface layer is dark gray and gray sandy loam about 26 inches thick. The underlying material is grayish brown and light brownish gray sandy loam to a depth of 70 inches. In a few areas the surface layer is fine sandy loam.

Included with this soil in mapping are a few small areas of Grangeville silt loam, Havala loam, San Emigdio loam, and Tujunga sand. Also included are a few areas of a soil that is similar to Yettem sandy loam but has a clay substratum. These included soils make up about 15 percent of the mapped acreage.

This Yettem soil has moderately rapid permeability and moderate available water capacity. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

Most areas of this soil are used for orchards and vineyards. Oranges, plums, olives, walnuts, and table grapes are the main crops. A few small areas are used for urban development.

This soil is well suited to orchards and vineyards. It is limited mainly by the moderate available water capacity. Proper tillage and maintaining crop residue on or near the surface help maintain soil tilth, water infiltration, and fertility. Sprinkler, drip, border, and furrow irrigation systems are suitable for orchards. Furrow and drip irrigation systems are most suitable for vineyards.

This soil is well suited to urban development. It has few limitations for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability unit IIs-4 (17), irrigated, and capability unit IVs-4 (17), nonirrigated. It has a Storie Index of 95.

177—Yettem sandy loam, 2 to 5 percent slopes. This very deep soil is well drained and gently sloping. It is on alluvial fans. It formed in alluvium derived from weathered granitic sources. Slopes are smooth and simple. Areas of this map unit are irregular in shape and range from about 10 to 200 acres in size. In a few areas the soil is dissected by shallow drainageways. The vegetation is mainly annual grasses and forbs. Elevation ranges from 300 feet to 1,500 feet, but it is mainly less than 1,000 feet. One small area is in Esham Valley at an elevation of 3,400 feet. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F. The average frost-free season ranges from 250 to 300 days.

Typically, the surface layer is dark gray and gray sandy loam about 26 inches thick. The underlying material is grayish brown and light brownish gray sandy loam to a depth of 70 inches. In a few areas the surface layer is fine sandy loam.

Included with this soil in mapping are a few small areas of Grangeville silt loam, Havala loam, Tujunga sand, and Wyman loam. Also included are a few areas in small valleys where the soil has a seasonal high water table. These included soils make up about 15 percent of the mapped acreage.

This Yettem soil has moderately rapid permeability and moderate available water capacity. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

This soil is used as rangeland and is suited to this use. The hazard of erosion is a slight limitation. Erosion can be controlled by leaving adequated residue on the surface. This soil responds well to fertilizer and seeding. It is well suited to the production of soft chess, wild oats, filaree, and burclover.

This soil is well suited to urban development. It has few limitations for building sites, roads and streets, and septic tank absorption fields.

This soil is in capability unit IIe-1 (17), irrigated, and IVe-1 (17), nonirrigated. It has a Storie Index of 90.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

By Michael B Jeffries, soil conservationist, and Clarence U Finch, conservation agronomist, Soil Conservation Service

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils are identified. The estimated yields of the main crops are listed for each soil. The system of land capability classification and land resource areas used by the Soil Conservation Service and the Storie Index used by the University of California are explained.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

The chief management practices for all soils of the central part of Tulare County that are suitable for crops and pasture are briefly discussed. When farming the soils, the major concerns are maintaining or improving the production capacities and preventing erosion. Needed management practices include, but are not limited to, the following: A conservation cropping system, maintaining crop residue on or near the surface, proper tillage, irrigation water management, cover crops, erosion control, excess water removal, pasture management, chiseling or subsoiling, and summer fallow. Technical assistance on planning and applying practices suitable for the soil on a particular farm can be obtained from local representatives of the Soil Conservation Service and the California Cooperative Extension Service.

A Conservation cropping system consists of growing crops in combination with needed management measures. If soil improving crops and practices more than offset the soil depleting crops and deteriorating practices, then it is a good conservation cropping system. Cropping systems are necessary on all tilled soils in the survey area.

Soil improving practices in a conservation cropping system include rotating primary crops with grasses and legumes and returning crop residue to the soil. It also includes the use of green manure crops and grasses and legumes, proper tillage, adequate fertilization, and weed and pest controls.

Many diverse cropping systems in the survey area use several combinations of individual crops. In a typical example alfalfa is grown for 3 to 5 years, followed by cotton for 1 or 2 years, then barley or sorghum grain for 1 year. The crop residue of the cotton and barley or sorghum grain should be returned to the soils, and tillage is reduced to only that which is necessary.

Crop residue utilization is the returning of crop residue to the soil. Residue returned to the soil helps maintain soil tilth, organic matter, and fertility and helps to control erosion. On sloping soils, residue should be left on or near the soil surface during critical periods of erosion.

Proper tillage is tilling the minimum number of times necessary to control weeds, to incorporate crop residue, to obtain favorable air and water movement in the soil, and to prepare an adequate seedbed. Tillage breaks down soil structure, reduces organic matter in the soil, and generally creates a plowpan directly below the plowed layer. These conditions increase the hazards of soil erosion, and the plowpan limits permeability and restricts root penetration. Varying the depth of tilling prolongs the development of the plowpan, and infrequent shallow chiseling helps break up the pan. Combining tillage operations to reduce the number of trips over a field and delaying tillage while soils are wet are also important in maintaining soil tilth and preventing compaction.

Irrigation water management is achieved by controlling the rate, amount, and timing of applications of water in a planned and efficient manner to soils to supply crop needs. This uses the available irrigation water and moisture supply to attain the desired crop response and minimize soil erosion and plant nutrient loss. Also proper management controls undesirable water loss and protects water quality. Irrigation is needed and methods used in the soil survey area are furrow, border, sprinkler, and drip. Furrow and border irrigation should be limited to soils that have slope of up to 3 percent. Sprinkler irrigation is adapted to all tillable soils of the area. Drip irrigation is suitable to orchards and vineyards. Irrigation water should be applied at a rate and amount to meet crop needs and according to characteristics of the soil without excess runoff or deep percolation.

Cover crops are necessary in orchards and vineyards and on other soils left fallow during the rainy season. Cover crops protect the soil from erosion and maintain or improve water penetration, soil tilth, and fertility. They are usually volunteer native plants. When a seeded cover is needed or desired, such grass species as barley, Blando brome, Cucamonga brome, and Wimmera 62 ryegrass can be planted alone. If a legume cover is used, such plants as crimson or rose clover, Lana vetch, birdsfoot trefoil, and strawberry clover can be seeded alone.

Erosion control is generally needed on sloping soils. As the steepness of the slope increases, erosion hazards increase. Erosion can be recognized by the accumulation of soil materials at the base of slopes, in drainageways, and against fence lines or by rills and gullies on the slope.

Many practices are used to control erosion. Good land leveling or smoothing, selection of the best method of irrigation, and control of irrigation waters help prevent erosion on irrigated soils. Cover crops, returning crop residue to the soil, vegetative cover in crop rotation, proper tillage, and cross-slope farming are some of the management practices used to control erosion. Either individually or in combination, such structures as diversions, grassed waterways, grade stabilization structures, dams, or streambank stabilization may be needed to control erosion.

Excess water removal is necessary if an accumulation of water, either from rainfall or irrigation, is in low lying areas, in swales, or at the lower end of irrigated fields. Excess water results in decreased crop production and may provide a habitat for unwanted weeds and mosquitoes.

Excess water may be controlled by shaping and grading, proper land smoothing, construction of open drainage ditches, subsurface drainage, the use of irrigation tailwater recovery systems, and proper management of irrigation waters.

Pasture management is needed for irrigated pastures to prevent soil deterioration, to provide for maximum production, to maintain a desirable plant community, and to extend the life of the pasture. Practices necessary in a pasture management program include: irrigation water management, rotating grazing by using a minimum of three fields, fertilization of plants, harrowing or dragging to scatter manure, and clipping grasses to maintain uniform growth. Grazing should start when plants are 8 to 10 inches high, and livestock should be moved to another field when a minimum of 3 to 4 inches of stubble remains.

When establishing a pasture, selection of an adaptable plant mixture is important. For most soils in the survey area, mixtures containing Akaroa orchardgrass or Goars fescue and birdsfoot trefoil or strawberry clover are well adapted. With proper pasture management, these species produce an abundance of high quality forage.

Chiseling or subsoiling is a method to increase the effective rooting depth of soils that have a plowpan or hardpan. Chiseling the plowpan and deep ripping the hardpan enhances permeability and internal drainage, helps prevent a perched water table, and allows deeper root penetration. Chiseling also temporarily benefits soils that have a heavy clay subsoil, which eventually seals up again. The depth of ripping should be based on the depth of the hardpan of a given soil.

Summer fallow stores moisture in the soil for later use by crops and helps control weeds, plant diseases, and insects. This means keeping the land free of vegetation during one crop season so that moisture is stored in the soil for crop production the following season. When a fallow system of farming is used, crop production tends to be more stabilized, and complete crop failures are less frequent during years of low rainfall. In this survey area a cropping sequence consists of small grain planted and harvested one year and summer fallow one year. The danger of erosion on sloping soils is lessened by keeping as much crop residue as possible on the surface of the land. The safest method of controlling erosion on sloping soils is subsurface tilling with sweeps or blades and delaying the first tillage until the spring following harvest

Soils strongly influence the kind of crops and pasture plants that can be grown in a soil survey area. Where climate and topography are about the same, crops that can be grown are related closely to the kind of soil.

Crops suited to soils of the survey area are listed and discussed under two broad categories: fruit and nut crops and field crops. Suitability of a crop for each soil is presented in the section "Detailed soil map units."

Fruit and nut crops suited to the soils in the survey area include: Oranges, olives, plums, table grapes, and walnuts.

Oranges are adapted to the valley soils west of the foothills, where air drainage is good. They are the main orchard crops grown in the survey area. Olives and plums are suited to the soils of the deep alluvial fans and ripped and leveled soils on terraces of the valley. Almonds are adapted to the clayey soils east and south of the town of Ducor. Table grapes are suited to the alluvial fans and the ripped and leveled soils on terraces near the towns of Cutler and Orosi. Walnuts are well suited to the deep, well drained, moderately coarse textured soils of the alluvial fans in the valley. Because of the lack of rainfall during part of the growing season, orchards and vineyards need to be irrigated.

Field crops suited to the irrigated soils in the survey area include: Cotton, tomatoes, alfalfa, barley, wheat, and pasture. These crops, except fresh tomatoes, are grown on the alluvial fans and terraces on the west side of the survey area. Most of the fresh tomatoes are grown on alluvial fans and terraces in the area around the towns of Cutler and Orosi Irrigated pasture is suited to moderately coarse and medium textured, deep soils near the Kaweah and Tule Rivers. Pasture plant mixtures of Akaroa orchardgrass or Goars fescue and narrowleaf trefoil or strawberry clover are well suited to soils in the survey area.

Dryfarmed wheat is suited to moderately deep to deep, well drained loam and clay soils east and southeast of the town of Ducor.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. Estimated yields of a few crops not shown in the table are included in individual map unit descriptions In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The yields are based mainly on the experience and records of farmers, conservationists, and extension agents.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects, favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 or in the map unit descriptions are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Thus, the capability unit is a convenient grouping for making many statements about management of soils for cropland. Capability units are designated by adding an Arabic numeral to the subclass symbol, for example, IIIs-3 or IVe-5. The numbers used to designate units within the subclasses and the problems or limitations of the units are as follows:

0. Indicates that a problem or limitation is caused by stony, cobbly, or gravelly material in the substratum.
1. Indicates that a problem or limitation is caused by slope or by actual or potential erosion hazard.
2. Indicates that a problem or limitation of wetness is caused by poor drainage or flooding.
3. Indicates that a problem or limitation of slow or very slow permeability of the subsoil or substratum is caused by a clayey subsoil or a substratum that is semiconsolidated.
4. Indicates that a problem or limitation is caused by sandy or gravelly soils that have a low available water capacity.
5. Indicates that a problem or limitation is caused by a fine textured or very fine textured surface layer.
6. Indicates that a problem or limitation is caused by salt or alkali.
7. Indicates that a problem or limitation is caused by rocks, stones, or cobblestones.
8. Indicates that a problem or limitation exists in the root zone, which generally is less than 40 inches over massive bedrock and lacks moisture for plants.
9. Indicates that a problem or limitation is caused by low or very low fertility, acidity, or toxicity that cannot be corrected by adding normal amounts of fertilizer, lime, or other amendments.

No unit designations are shown for class I because characteristics are similar for all soils in this class. Unit designations are also omitted from class V through VIII because these soils are normally not intensively managed as cropland.

Capability groupings are identified at the end of each map unit description in the section "Detailed soil map units."

major land resource areas

In the central part of Tulare County, capability classification is further refined by designating the land resource area in which the soil occurs. A land resource area is a broad geographic area that has a distinct combination of climate, topography, vegetation, land use, and general type of farming. Parts of three of these nationally designated areas are in the survey area. These areas and their numbers are Sacramento and San Joaquin Valleys (17); Sierra Nevada Foothills (18); and Sierra Nevada Range (22). The number of the resource area is added, in parentheses, to the class, subclass, and capability unit designation for complete identification of the capability unit.

A soil in one resource area may have characteristics similar to those of a soil in another resource area and the same capability symbol, but the climate, vegetation, crops that are suited, and management practices needed may differ. For example, both capability subclass VIs (18) and VIs (22) contain very rocky, deep, well drained soils. The soils in capability subclass VIs (18) are in the Sierra Nevada foothills and are not suited to coniferous trees, but those in capability subclass VIs (22) are in the Sierra Nevada Range and are suited to coniferous trees because of more soil moisture.

Storie index

Prepared by Gordon L Huntington, soil specialist, Department of Land, Air, and Water Resources, University of California, Davis

The soils of Tulare County, California, Central Part, are rated according to the Storie Index *(11, 12)*. This index expresses numerically the relative degree of suitability of a soil for general intensive agriculture as it exists at the time of evaluation. The rating is based on soil characteristics only and is obtained by evaluating factors such as soil depth, surface texture, subsoil characteristics, drainage, salts and alkali, and relief. Other factors, such as availability of water for irrigation, climate, and distance to markets, that might determine the desirability of growing certain crops in a given locality are not considered. Therefore, in itself, the index should not be considered as a direct measurement of land value. Where economic factors are known to the user, however, the Storie Index provides additional objective information for value comparisons of land tracts. In this

report the Storie Index rating is given at the end of each map unit description.

Four general factors are considered in the Storie Index rating These factors are (A) the characteristics of the soil profile and the depth of the soil; (B) the texture of the surface, (C) the dominant slope of the map unit; (X) other less permanent factors that are more readily subject to management or modification. In this area the X factors are drainage, flooding, saline-sodic conditions, general nutrient level of the soil, and microrelief of the surface. For some soils more than one X factor is used. Each of the four general factors is evaluated on the basis of 100 percent. A rating of 100 percent expresses the most favorable or ideal condition for general crop production; lower percentage ratings are assigned for conditions that are less favorable. Factor ratings are selected from tables prepared originally from data and observations that relate soil properties, plant growth, and crop yield *(10)*

In the current tables *(11, 12)* certain soil properties are allowed ranges of values to conform with variations of the properties that affect the suitability of the soil for general agricultural purposes (i.e. soil depth, proportion of gravel present in a gravelly loam surface texture). Where ranges of values for these properties exist within a given map unit, the modal condition for the property is used in assigning a rating value to the factor.

The index rating for a soil is obtained by multiplying the factor ratings given for A, B, C, and X; thus, any factor may dominate or control the final rating For example, consider a soil such as Lewis clay loam. It has a silica-lime, cemented hardpan, which is at a moderate depth and is under a strongly saline-sodic affected subsoil. This warrants a rating of 45 percent for factor A. It has a surface layer of workable clay loam that requires some care in handling, so it warrants a rating of 85 percent for factor B A smooth, nearly level surface justifies 100 percent for factor C. Its saline-sodic (alkali) condition, however, merits a rating of only 40 percent for factor X Multiplying these four percentages gives a Storie Index of 15 percent for this soil. If the hardpan can be broken and the saline-sodic condition of the subsoil can be improved by reclamation practices, the Storie Index should be increased by assigning the appropriate higher values to the A and X factors to reflect the changed conditions.

Soil-Rock outcrop complexes in the survey area, such as Vista-Rock outcrop complex, 9 to 50 percent slopes, are rated to reflect the proportion of the dominant soil described as present in the map unit. Ratings for each of the map units are for the dominant soil. They do not take into account small inclusions of other kinds of soils or miscellaneous areas.

Soils are placed in grades according to their suitability for general intensive farming as shown by their Storie Index ratings. The six grades and their range in index ratings are:

	Index rating
Grade 1	80 to 100
Grade 2	60 to 80
Grade 3	40 to 60
Grade 4	20 to 40
Grade 5	10 to 20
Grade 6	Less than 10

Soils of Grade 1 are excellent or well suited to general intensive farming. Grade 2 soils are good or are also well suited to farming, although they are not so desirable as soils of Grade 1. Grade 3 soils are only fairly well suited to farming. Grade 4 soils are poorly suited, and Grade 5 soils are very poorly suited. Grade 6 consists of soils and miscelleaneous areas that are not suited to farming.

saline-alkali soils

Soluble salts and sodium in soils can be traced to several sources Most originated in the decomposition of soil minerals and rocks by weathering. In this area, where rainfall is low and evaporation is high, soluble salts remain within the soil and may accumulate sufficiently to restrict plant growth. In addition many low-lying areas receive salt-charged runoff or ground water. In areas that have a high water table, water may rise by capillary action and bring dissolved salts to the surface of the soil. The salts remain as the moisture evaporates. Percolating water from seasonal rainfall modifies the location and the amount of salts that accumulate within the soil, but they do not remove the salts from the soil.

A soil that contains harmful concentrations of salts and exchangeable sodium and is very strongly alkaline is a saline-alkali soil. In the central part of Tulare County, one soil is classified as saline-alkali. It is in the Lewis series and makes up about 1,500 acres. Lewis clay loam is north and northeast of the town of Lindsay near Lewis Creek and northwest of the town of Seville.

Guidelines for reclamation. Field and laboratory determinations indicate that amounts of soluble salts and sodium can vary considerably within short distances. Soil conditions vary so much, a general statement cannot be made about the specific salts each soil contains nor about the practices needed to improve any particular soil. Some general guidelines can be given, however, that should be helpful in dealing with the problem

The key items to consider in planning a reclamation program are the following:

Water supply. Ample supplies of water of good quality are a primary requirement. More water should be applied than is needed to grow crops The additional water is for leaching the salts downward into the lower part of the subsoil or below If extensive reclamation is planned in the area and the content of salt is not known, a laboratory determination should be made

Drainage. Adequate drainage is needed to remove excess salts from the soil. Whatever the other conditions may be, improvement is likely only to that depth in the soil for which adequate drainage can be provided. The better the drainage, the more readily excess salts can be removed. If drainage is not adequate, and no measures are taken to improve it, little change is likely.

Rate of internal drainage. Many factors affect downward movement of water through the soil: texture, bulk density, porosity, structure, and the shrinking or swelling of the soil upon wetting and drying. The more rapid the rate of internal drainage, the more quickly excess salts can be removed and the sooner improvement can be obtained.

The Lewis clay loam in the survey area has a dense, very slowly permeable subsoil and a cemented hardpan. Unless this soil is deeply plowed and mixed or is ripped and the hardpan is broken, reclamation generally is not sucessful.

Amount of excess salts and sodium. If internal drainage is adequate or is artificially improved, even severely affected saline soils can be readily improved by soaking the soil deeply. The use of sufficient water to flush the salts downward is all that is needed.

Removing excess sodium is somewhat more difficult and expensive than removing excess salts. A chemical change must take place in the soil. This is generally brought about by applying gypsum, or calcium sulfate. A soil test shows how much gypsum to use. Gypsum supplies the calcium to replace the excess sodium on the surface of the clay particles. The needed calcium can also be obtained by applying sulfuric acid in bulk quantities. The acid reacts with the calcium carbonate prevalent in the soil. Both the calcium and hydrogen ions from the acid work to displace the adsorbed sodium. The acid method often achieves quick results, but it is more expensive and extra care is needed in handling the acid. Elemental sulfur also can be used instead of gypsum, but sulfur takes longer to react. Before it can act, sulfer must be changed to sulfate. This is done by microbes living in the soil. About the same result is obtained using any of these materials, but time and cost differences should be considered.

Reclamation practices. On the basis of these guidelines, the Lewis clay loam in the central part of Tulare County is a difficult soil to reclaim. The key practices needed to improve this soil include: Leveling; deep ripping that shatters the hardpan or substratum to improve internal drainage; establishing drainage ditches or subsurface drains; applying large amounts of gypsum or sulfur to correct the alkali conditions; applying water to leach excess salts downward; and establishing plants that tolerate salts and sodium.

Assistance in interpreting laboratory tests of soil and water and detailed reclamation schedules for various soil conditions can be obtained from the local office of the Soil Conservation Service or the Tulare County Farm Advisor's Office.

rangeland

J David Swanson, range conservationist, Soil Conservation Service, assisted in preparing this section

About 60 percent of the survey area is used as rangeland. The major use of the rangeland is for beef production. Stocker and commercial cow and calf operations are the most common.

Range management is based on understanding the kinds of primary forage and annual grasses. Perhaps the major disadvantage of the annual grasses is that they are shortlived. Their shallow root systems enable them to remain green only as long as the surface layer is moist. Annual grasses start growing upon arrival of winter rains, but drought follows shortly thereafter. By June the grasses begin to mature and then soon die. Protein deficiencies in livestock become serious in early summer; thereafter, normal gains can be expected only through careful supplementing. Consequently, the primary grazing season is in the winter and spring, although on some farms cattle are grazed throughout the year. Quality forage is available most years from November to June.

Soils strongly influence the natural vegetation. Soils in the valley, below the foothills, generally are moderately deep to deep, well drained sandy loam, loam, and clay of granitic and gabbro sources. Throughout the valley hardpan soils are on old terraces. The hardpan is at a depth of 20 to 40 inches. Vegetation of the valley soils is mainly annual grasses and forbs. A few, scattered hardwood trees grow in the deep alluvial soils. Because of the low rainfall, vegetation on the valley soils usually matures earlier than vegetation on the foothills. Forage production is highest during winter and early spring.

Soils on the lower foothills are shallow to deep, somewhat excessively drained and well drained, and coarse sandy loam to clay. These soils are over granitics, mica schist, and gabbro. Forage production on the shallow soils is low because of low available water capacity and shallow rooting depth. The moderately deep and deep soils are the highest producing soils in the area. The soils on the cooler, north-facing slopes and at higher elevations have a tendency to grow a dense cover of shrubs and hardwood trees. These woody plants are a limitation. If they can be economically cleared the soils produce a good cover of desirable grasses and forbs.

Soils on the upper foothills are shallow to deep, well drained coarse sandy loam, sandy loam, and loam. These soils are over granitic rock. The dominant vegetation is conifers and hardwood trees. The understory consists of shrubs and grasses. The woody plants are a limitation. If the woody plants can be economically cleared at the lower elevations to create open areas, the soils produce a good cover of forage and browse plants. For each kind of soil, information about rangeland is presented in the section "Detailed

soil map units." Planners of range management systems for individual fields or ranches should consider the information given in the description of each soil.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 6 shows, for each soil, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as or are suited to rangeland are listed. Explanation of the column headings in table 6 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was established during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important. In table 6, the land resource area is designated by a number in parenthesis following each range site name. The areas and their numbers are: Sacramento and San Joaquin Valleys (17); Sierra Nevada Foothills (18); and Sierra Nevada Range (22). For further information see the section "Major land resource areas."

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre reduced to a common percent of air-dry moisture

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. This includes the current year's growth of leaves, twigs, and fruits of woody plants. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

The chief management concerns for all soils in the survey area include, but are not limited to: Proper grazing use, fertilization, range seeding, and brush management. Technical assistance on planning rangeland managemant and applying practices suitable for the soil on a particular farm can be obtained from local representatives of the Soil Conservation Service and Cooperative Extension Service.

Proper grazing use requires grazing at an intensity which maintains enough cover to protect the soil and which maintains or improves the quantity and quality of desirable vegetation. This increases the vigor and reproduction of key plants and accumulates litter and mulch necessary to conserve soil and water. Maintaining proper distribution of cattle also helps maintain vegetative condition, increase forage production, and maintain natural beauty.

The amount of cover needed to protect soils from surface erosion changes with length and degree of slope. Normally an adequate average height is 2 inches of stubble on slope of 0 to 30 percent and 3 inches of stubble on slope of 30 percent or more. At these heights, the stubble amounts to approximately 700 to 1,000 pounds per acre and 1,000 to 2,000 pounds per acre, respectively, of current year's growth. These levels encourage a desirable grass-forb balance while preventing excessive soil erosion.

Practices that may facilitate proper distribution of grazing are: fencing; distribution of water for livestock; stock trails; location of salt, minerals, and supplemental feed; and herding.

Fertilzation is the addition of natural or manufactured nutrient-containing materials, usually inorganic, to the soil to aid in initial establishment of desirable plants or to improve existing plants. Fertilization increases forage production and lengthens the grazing season. In addition, the plant cover helps control erosion. Whenever a range reseeding program is used, fertilization should be considered; however, in areas where rainfall is less than 12 inches, fertilization is not usually recommended.

Range seeding establishes plants to produce more forage or to convert an area to rangeland. This also improves the natural beauty and controls soil erosion and water loss.

Brush Management eliminates or reduces competition of woody vegetation to establish or reestablish a satisfactory cover of grasses. Forage production increases and helps control soil and water loss. Reducing brush provides better fire control. Also, increasing grassland improves habitat for some species of wildlife and provides recreational sites and natural beauty. Mechanical, chemical, or biological methods are used to kill or suppress brush.

woodland management and productivity

Commercial trees comprise only a small part of the agricultural production of the survey area. The Crouch

and Holland soils are the only soils suitable for commercial production of trees. They comprise about 5 percent of the soil survey area. Significant conifer growth begins at 4,000 feet for the Holland soils and at 4,500 feet for the Crouch soils. Ponderosa pine, Jeffrey pine, sugar pine, white fir and incense-cedar are the principal commercial conifer trees A few groves of giant sequoia are on the Crouch soil in the Tule River Indian Reservation.

Lumber production is limited. Only one manufacturing plant is located in the survey area. There continues to be considerable harvesting of the various oaks for firewood.

Woodland management and productivity is described in the soil descriptions for the Crouch and Holland soils.

recreation

Demand for recreational facilities within the central part of Tulare County will increase as population and leisure time increases. Some of this increased demand can be met by private recreational development.

Private recreational facilities can be developed as a supplemental enterprise to farming or ranching. The foothills of the survey area have good potential for the development of such private recreational facilities as hunting and fishing clubs, campgrounds, and guest ranches. Lake Kaweah and Lake Sucess furnish good opportunities for fishing, boating, and swimming. In addition, the survey area has several golf courses and community parks.

The soils of the survey area are rated in table 7 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 7, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 7 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 10 and interpretations for dwellings without basements and for local roads and streets in table 9.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

wildlife habitat

Wildlife and fish are important resources within the central part of Tulare County. Fish and wildlife provide numerous opportunitites for recreation, as well as improve the quality of the environment. Wildlife related activities, such as nature study, bird watching, and fishing, have an effect on the area's economy. Many types of wildlife help in the natural control of weed, insect, and animal pests.

Warm water fish include: Largemouth bass, smallmouth bass, black crappie, catfish, and sunfish. These fish inhabit the lakes and ponds within the survey area. Trout are in the rivers, but trout can be stocked in some lakes and ponds where water temperatures permit.

Animals, such as the bobcat and coyote, are useful rodent predators. Red-tailed hawks also feed on rodents. California quail, mourning dove, ring-necked pheasants, and small birds, such as meadowlark and field sparrows, eat a variety of seeds, many of which are considered rangeland or cropland weeds. Woodpeckers and thrushes eat insects, which can be harmful to trees and crops.

Man's activities have varied effects on the wildlife population Many wildlife species, such as sparrows, blackbirds, and ground squirrels, can tolerate man's activities and actually thrive in close association with man In contrast the existence of some species has been threatened by man and his activities.

Three forms of wildlife listed as rare or endangered species are within the central part of Tulare County *(5)*. The San Joaquin kit fox, listed as rare, is in the Porterville area Conversion of valley lands to irrigated farming is reducing the range of the kit fox, confining it to valley areas that are unsuited to agriculture and to rolling foothills and canyons. Two other forms of wildlife, which occur in the survey area, are on the endangered species list: the blunt-nosed leopard lizard and the California condor. The critical habitat for these rare and endangered species needs to be preserved.

Important game species such as California mule deer, California quail, band-tailed pigeon, mourning dove, and wild turkey are in the survey area.

Wildlife, such as ground squirrels, cause crop and range damage.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 8, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, wild oats, vetch, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing trees and shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are mountainmahogany, buckbrush, and manzanita.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control

structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include California quail, pheasant, meadowlark, field sparrow, cottontail, and coyote.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, shore birds, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include: Brush rabbit, California mule deer, California quail, and scrub jay. Additional information on wildlife habitat can be found in the section "General soil map for broad land use planning."

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 9 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves,

utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

sanitary facilities

Table 10 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations, and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 10 also shows the suitability of the soils for use as daily cover for landfills A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 10 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of

landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 11 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill, topsoil, sand, and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 11 provide quidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less

than 8 percent They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth

water management

Table 12 gives information on the soil properties and site features that affect water management. The kinds of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; drainage; irrigation; terraces and diversions, and grassed waterways.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material It also affects trafficability

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding, slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering properties and classifications

Table 13 gives estimates of the engineering classification and of the range of engineering properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U S Department of Agriculture These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0 420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent.

Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

physical and chemical properties

Table 14 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

soil and water features

Table 15 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations made during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation are also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Cemented pans are hard subsurface layers, within a depth of 5 or 6 feet, that are strongly compacted (indurated). Such pans cause difficulty in excavation. The hardness of pans is similar to that of bedrock A rippable pan can be excavated, but a hard pan generally requires blasting.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*14*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 16, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders The last syllable in the name of a suborder indicates the order. An example is Xeralf (*Xer*, meaning dry, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons, soil moisture and temperature regimes; and base status Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haploxeralfs (*Hapl*, meaning minimal horizonation, plus *xeralf*, the suborder of the Alfisols that have an xeric moisture regime)

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haploxeralfs.

FAMILY Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, thermic Typic Haploxeralfs.

SERIES. The series consists of soils that have similar horizons in their profile The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Five soil orders are represented in the central part of Tulare County. Alfisols, Entisols, Inceptisols, Mollisols, and Vertisols.

The soils have a xeric moisture regime and a mesic or thermic temperature regime. The xeric moisture regime is that typified in Mediterranean climates, where winters are moist and cool and summers are warm and dry. Therefore, unless the soil is irrigated, the moisture control section is dry in all parts for 45 consecutive days or more from July until October in 6 out of 10 years. The moisture control section is moist in all parts for 45 consecutive days or more from December until May.

The temperature regime is thermic in the San Joaquin Valley and lower Sierra Nevada foothills. The thermic temperature regime is one in which the soil temperature at a depth of 50 cm ranges from 15 degrees C to 22 degrees C. In the upper Sierra Nevada foothills, the temperature regime is mesic. The mesic temperature regime is one in which the soil temperature at a depth of 50 cm ranges from 8 degrees C to 15 degrees C.

Alfisols are soils that have a massive and hard A horizon and an argillic B horizon. They have high base saturation, and water is held at less than 15 bar tension during at least 3 months of each year when the soil is warm enough for plants to grow.

Alfisols in this area have been placed in the Xeralf suborder. They have a xeric moisture regime; winters are moist and cool and summers are warm and dry. The Xeralfs are divided into three great groups, the Durixeralfs, Rhodoxeralfs, and Haploxeralfs. Durixeralfs are Xeralfs that have a duripan whose upper boundary is within 1 meter of the soil surface but is below an arillic or a natric horizon. Rhodoxeralfs are Xeralfs that have an argillic horizon that, in all parts, has a color hue redder than 5YR and a value, in moist soil, of less than 4 and a

value, in dry soil, of no more than one unit higher. They do not have a natric horizon or a duripan. Haploxeralfs are Xeralfs that do not have a duripan. They have an argillic horizon that has a color hue of 5YR or yellower in some parts.

Soils in three subgroups of Durixeralfs were mapped in the survey area. The subgroup of Typic Durixeralfs consists of Durixeralfs that have an argillic horizon of a loamy particle size class. Exeter soils, which are on terraces and formed in alluvium from acid igneous rock, have been placed in this subgroup.

The subgroup of Abruptic Durixeralfs consists of Durixeralfs that increase in clay more than 15 percent (absolute) within a vertical distance of 2.5 cm at the upper boundary of the argillic horizon. San Joaquin soils, which are on terraces and formed in alluvium from acid igneous rock, have been placed in this subgroup.

The subgroup of Natric Durixeralfs have a natric horizon that is high in sodium immediately over the duripan. The saline-alkali Lewis soils have been placed in this subgroup.

Soils in one subgroup of Rhodoxeralfs were mapped in the survey area. The subgroup of Typic Rhodoxeralfs consists of Rhodoxeralfs that have a dark red argillic horizon and do not have a calcic horizon or lithic contact within 50 cm of the soil surface. An example is the Las Posas soils, which are in the foothills and which formed in material weathered from gabbro.

Soils in three subgroups of Haploxeralfs were mapped in the survey area. The subgroup of Typic Haploxeralfs are Haploxeralfs that have a pale brown A horizon of less than 1 percent organic matter throughout and an argillic horizon that has a base saturation (by sum of cations) that is 75 percent or more. The Blasingame, Fallbrook, Greenfield, Sesame, and Wyman soils have been placed in this subgroup. Blasingame, Fallbrook, and Sesame soils are on foothills and formed in material weathered from granitic rock. Greenfield soils formed in alluvium derived from acid igneous rock. Wyman soils formed in alluvium derived from basic igneous rock.

The subgroup of Mollic Haploxeralfs consists of Haploxeralfs that are between 1 and 4 percent organic matter in the upper 10 cm. Coarsegold and Trabuco soils have been placed in this subgroup. Coarsegold soils are on foothills and formed in material weathered from mica schist. Trabuco soils are on foothills and formed in material weathered from basic igneous rock.

The subgroup of Ultic Haploxeralfs consists of Haploxeralfs that have base saturation (by sum of cations) that is less than 75 percent in some of the subhorizons within 75 cm of the upper boundary of the argillic horizon. Auberry and Holland soils, which are in the foothills and which formed in material weathered from granitic rock, have been placed in this subgroup.

Entisols are soils in this area that have little or no evidence of development of pedogenic horizons.

The Entisols in this area are in the Orthent, Fluvent, and Psamment suborder. All of these do not have a B horizon and generally are less than 1 percent organic matter.

The Orthents have a particle-size class that is loamy or finer in some horizon below the Ap horizon and have slope of greater than 25 percent or have an organic-carbon content that decreases regularly with increasing depth. The organic carbon reaches a level of 0.2 percent or less within a depth of 1.25 meters.

Fluvents are like Orthents except organic matter content decreases irregularly to at least 1.25 m. These soils are on alluvial fans and are very deep.

Psamments are loamy fine sand or coarser in the textural control section. These soils are on alluvial fans and are deep to very deep.

The Orthents, Fluvents, and Psamments have been placed in the Xerorthent, Xerofluvent, and Xeropsamment great groups since they have a xeric moisture regime.

The subgroup of Typic Xerorthents consists of Orthents that have a brown or light brownish gray A horizon and less than 1 percent organic matter throughout. Cieneba soils, which are in the foothills and which formed in material weathered from granitic rock, have been placed in this subgroup. Honcut soils, which are on alluvial fans and which formed in alluvium from granitic sources, are also in this subgroup.

The subgroup of Typic Xerofluvents consists of Xerofluvents that formed on alluvial fans in alluvium from mixed rock. San Emigdio is the only soil classified in this subgroup.

The subgroup of Typic Xeropsamments consists of Psamments that do not have thin layers of clay accumulation or dark colored mottles at a depth of less than 1 meter. The coarse-textured Tujunga soil formed in recent alluvium is the only soil classified in this subgroup.

Inceptisols are soils in which altered horizons have lost bases or iron and aluminum but have retained some weatherable minerals. These soils do not have an illuvial horizon enriched either with silicate clay that contains aluminum or with an amorphous mixture of aluminum and organic carbon.

The Inceptisols in this area are in the Ochrept suborder. They have an ochric epipedon and a cambic horizon They do not have a mollic epipedon because either the color, organic matter, or structure are lacking. The cambic horizon increases in clay by 1 to 2 percent and has structure. The texture is coarse sandy loam or finer. Since these soils have a Xeric moisture regime, they have been placed in Xerochrepts great group.

The subgroup of Typic Xerochrepts consists of Ochrepts that are less than 1 percent organic matter throughout the profile. The cambic horizon has a few thin clay films. Vista soils, which are on foothills and which formed in material weathered from grantic rock, are included in this subgroup.

Mollisols are soils that typically have a dark colored surface layer which is more than 25 cm thick, which is

more than 1 percent organic matter, and which is not both hard and massive. Base saturation of this layer is more than 50 percent.

In this area the Mollisols are in the Xeroll suborders. These soils formed in a warm, subhumid climate or in a semiarid climate where a natural, supplemental source of water extends the growing season. Winters are cool and moist, and summers are hot and dry. Unless irrigated, these soils are dry throughout the root zone for more than 60 consecutive days during the 3-month period following the summer solstice.

The Xerolls are divided into two great groups: Argixerolls and Haploxerolls. Soils that do not have a clay enriched B horizon or layers strong in calcium carbonates are classified in the Haploxeroll great group. Soils that have a clay enriched B horizon, a clear to gradual boundary between the A and B horizons, and lack strong calcium carbonate layers have been placed in the Argixeroll great group.

Soils in six subgroups of Haploxeroll were mapped in the survey area. The subgroup of Typic Haploxerolls consists of soils that were not wet while forming and that do not have hard rock at a depth of less than 50 cm. These soils have more than 75 percent base saturation in the upper 75 cm of the profile, and organic matter content decreases regularly with depth. The mollic epipedon is less than 50 cm thick and has more than 1 percent organic matter. Walong soils have been placed in this subgroup. Walong soils are on foothills and formed in material weathered from grantic rock.

The subgroup of Entic Haploxerolls are like Typic Haploxerolls with two exceptions. The Entic Haploxeroll soils do not have a cambic horizon or the lower part of the epipedon does not meet the requirements for a cambic horizon, excepting in color value. Yettum is the only soil in this subgroup. Yettum soils are on alluvial fans and formed in alluvium weathered dominately from granitic sources.

The subgroup of Entic Ultic Haploxerolls are like Entic Haploxerolls except the Entic Ultic Haploxerolls have a base saturation (by sum of cations) of less than 75 percent throughout the soil and lack a cambic horizon. Sheephead soils have been placed in this subgroup

The subgroup of Fluvaquentic Haploxerolls are like Typic Haploxerolls except their content of organic carbon decreases irregularly with depth to a level of 0 3 percent organic carbon or less within 1.25 meters of the soil surface. They can be either with or without a calcic or soft powdery lime, and do not have a B horizon. The Grangeville series are included in this subgroup. Grangeville soils are on alluvial fans and formed in alluvium that weathered dominately from granitic sources. This soil has been artificially drained.

The subgroup of Lithic Haploxerolls are like Typic Haploxerolls The Lithic Haploxerolls have lithic contact within 50 cm of the soil surface but do not have a B horizon, a calcic horizon, or soft and powdery secondary lime Friant soils are placed in this subgroup. Friant soils are on foothills and formed in material weathered from mica schist. Parent rock is the principal factor accounting for the characteristics of these soils. The rock is slowly weathered under the local climatic conditions and results in a shallow soil

The subgroup of Ultic Haploxerolls are like Typic Haploxerolls but the Ultic Haploxerolls have base saturation (by sum of cations) of less than 75 percent throughout the upper part of the soil to a depth of 75 cm. Crouch soils are placed in this subgroup. They are on the upper foothills and formed in material weathered from granitic sources.

The subgroup of Pachic Argixerolls consists of soils that were not wet while forming. They have a mollic epipedon more than 50 cm thick and are more than 1 percent organic matter. They have a base saturation (by sum of cations) of more than 75 percent throughout the upper 75 cm. Havala soils are placed in this subgroup. They are on alluvial fans and formed dominantely from granitic sources.

Vertisols are soils that are fine textured throughout and consist in part of clays that swell and shrink significantly on wetting and drying. Unless irrigated, these soils dry in summer and crack open from the surface downward to a depth of at least 50 centimeters. Because of negligible rainfall in the summer, the cracks remain open for more than 60 consecutive days each year. These soils typically have an A horizon that is firm and massive when moist but becomes granular or blocky and hard or very hard when dry. Surface soil falls into cracks in these soils when they are dry and causes internal displacement. Because of the internal churning that takes place in these soils, development of a B horizon is not possible. Another result of this internal churning is intersecting slickenside faces in the clayey substratum. Vertisols in this area have been placed in the Xerert suborder, which has a xeric moisture regime. The Xererts are divided into two great groups: Chromoxererts and Pelloxererts. Chromoxererts are the Xererts that have some subhorizons in the upper 30 cm that have dominant chroma, (moist soil) of 1.5 or more in the matrix in more than half of each pedon. Pelloxererts are the Xererts in which all subhorizons in the upper 30 cm have chroma, (moist soil) of less than 1.5 which is dominant in the matrix and which is in more than half of each pedon.

Centerville, Cibo, Porterville, and Seville soils have been placed in the Typic Chromoxererts. Centerville soils are on alluvial fans and dissected terraces. They formed in alluvium weathered dominantely from granitic sources. Cibo soils are on foothills and formed in material weathered from gabbro. Porterville soils are on alluvial fans and formed in alluvium weathered from basic igneous rock.

Clear Lake soils have been placed in the Typic Pelloxererts subgroup. Clear Lake soils are poorly drained soils in basins and have formed in alluvium weathered from granitic sources.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*13*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*14*). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Auberry series

The Auberry series consists of deep, well drained soils that formed in material weathered from quartz diorite. Auberry soils are on uplands. Slope ranges from 5 to 50 percent. Mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F.

Auberry soils are similar to the Blasingame, Fallbrook, Holland, and Sesame soils. They are near the Blasingame, Coarsegold, Crouch, Fallbrook, Holland, Vista, and Walong soils. Blasingame, Coarsegold, Sesame, Vista, and Walong soils have paralithic contact with rock at a depth of 20 to 40 inches. Fallbrook soils have base saturation of 75 percent or more in the argillic horizon. Crouch and Holland soils have soil temperature of less than 59 degrees F at a depth of 20 inches.

A typical pedon of Auberry sandy loan, is located in an area of Auberry-Rock outcrop complex, 9 to 50 percent slopes, on the Tule River Indian Reservation, 2,000 feet south and 10 feet east of the northeast corner of projected sec. 4, T. 22 S., R. 30 E.; Camp Nelson S.W Quadrangle:

A1—0 to 11 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; massive; hard, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and common fine tubular pores; slightly acid (pH 6.5); clear wavy boundary.

A3—11 to 16 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; massive; hard, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and common fine tubular pores; slightly acid (pH 6.5); clear smooth boundary.

B1t—16 to 22 inches, yellowish brown (10YR 5/4) loam, brown (10YR 4/3) moist; moderate coarse subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common fine roots; many very fine, common fine, and few medium tubular pores; common moderately thick clay films lining pores and bridging sand grains; slightly acid (pH 6.3); gradual smooth boundary.

B21t—22 to 32 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic, common fine roots; many very fine and common fine tubular pores, common moderately thick clay films lining pores and bridging sand grains, and few moderately thick clay films on faces of peds; slightly acid (pH 6 3); gradual smooth boundary.

B22t—32 to 43 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; massive; hard, friable, slightly sticky and slightly plastic; common fine roots; few fine tubular pores; few thin clay films lining pores and bridging sand grains; medium acid (pH 6.0); clear smooth boundary.

B3—43 to 56 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic, few fine tubular pores; neutral (pH 7.0); clear smooth boundary.

Cr—56 inches; strongly weathered quartz diorite.

This soil has paralithic contact at a depth of 40 to 60 inches.

The A horizon is dark grayish brown, grayish brown, brown, light brownish gray, or pale brown (10YR 4/2, 5/2, 5/3, 6/2, or 6/3). It is medium acid or slightly acid. The B2t horizon is brown, grayish brown, light brownish gray, pale brown, light yellowish brown, or strong brown (10YR 4/3, 5/2, 5/3, 6/2, or 6/4; 7.5YR 5/2, 5/4, or 5/6). It is loam, clay loam, or sandy clay loam. Reaction of the B2t is strongly acid to slightly acid.

Blasingame series

The Blasingame series consists of moderately deep, well drained soils that formed in material weathered from quartz diorite Blasingame soils are on uplands. Slope ranges from 9 to 50 percent. Mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F.

Blasingame soils are similar to the Auberry, Coarsegold, Fallbrook, and Sesame soils. They are near the Auberry, Cieneba, Coarsegold, Fallbrook, Sesame, Vista, and Walong soils. Auberry soils are deep and have base saturation of less than 75 percent in the argillic horizon. Coarsegold soils have more organic matter in the A horizon than Blasingame soils have. Fallbrook soils are 40 to 60 inches deep to paralithic contact. Sesame soils have 10YR hue in the Bt horizon. Cieneba soils have paralithic contact at a depth of less than 20 inches. Vista soils have a coarse loam cambic horizon. Walong soils have a mollic epipedon.

A typical pedon of Blasingame sandy loam, 15 to 30 percent slopes, is located about 10 miles east of Orosi, 1,500 feet west and 1,650 feet north of the southeast corner of sec. 32, T. 15 S., R. 26 E.; Stokes Mountain Quadrangle·

A1—0 to 7 inches; brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; massive, hard, friable, slightly sticky and nonplastic, many very fine roots, many very fine tubular pores; slightly acid (pH 6.5); gradual smooth boundary.

B1t—7 to 12 inches; reddish brown (5YR 4/4) loam, dark reddish brown (5YR 3/3) moist; massive; hard, friable, slightly sticky and slightly plastic, many very fine, common fine, and medium roots; many very fine tubular pores; 3 percent gravel; neutral (pH 6.8); clear smooth boundary.

B21t—12 to 22 inches; reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; weak medium subangular blocky structure; hard, friable, sticky and slightly plastic; many very fine, common fine, and medium roots; many very fine tubular pores; weak thin clay films lining pores and bridging sand grains; 5 percent gravel; neutral (pH 6.8); gradual smooth boundary.

B22t—22 to 36 inches; reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; moderate medium angular blocky structure; hard, friable, sticky and plastic; many very fine and common fine roots; many very fine tubular pores; common moderately thick clay films on faces of peds; 5 percent gravel; neutral (pH 6.8); clear wavy boundary.

Cr—36 inches; strongly weathered quartz diorite.

This soil has paralithic contact at a depth of 20 to 40 inches. It is from 0 to 10 percent gravel.

The A horizon is brown, dark yellowish brown, grayish brown, or yellowish brown (10YR 4/3, 4/4, 5/2, or 5/4; 7.5YR 5/4) It is sightly acid or neutral. The Bt horizon is brown, dark reddish brown, reddish brown, yellowish red, or red (7.5YR 5/4; 5YR 3/3, 3/4, 4/3, 4/4, or 4/6; 2.5YR 3/4, 4/4, or 4/6). It is loam, sandy clay loam, or clay loam. It is medium acid to neutral. The Cr horizon is strongly weathered quartz diorite or granodiorite.

Figure 7—A profile of Centerville clay

Centerville series

The Centerville series consists of moderately deep, well drained soils that formed in alluvium, mainly from granitic sources (fig 7). Centerville soils are on alluvial fans and dissected terraces. Slope ranges from 0 to 30 percent. Mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F.

Centerville soils are similar to the Cibo, Porterville, and Seville soils. They are near the Exeter, Porterville, San Joaquin, and Wyman soils. Cibo soils have lithic contact at a depth of 20 to 40 inches. Exeter, San Joaquin, and Seville soils have a duripan at a depth of 20 to 40 inches. Porterville and Wyman soils are more than 60 inches deep.

A typical pedon of Centerville clay, 2 to 9 percent slopes, is located about 2 miles north of Ducor, 1,400 feet west and 1,450 feet north of the southeast corner of sec. 18, T. 23 S., R. 28 E.; Fountain Springs Quadrangle:

Ap—0 to 12 inches; dark grayish brown (10YR 4/2) clay, dark brown (10YR 3/3) moist; massive, 1/4 to 1/2

inch of strong fine granular structure on the surface; very hard, firm, very sticky and very plastic; many fine and common fine roots, concentrated mainly in the cracks; many very fine tubular pores; moderately alkaline (pH 8.0); gradual smooth boundry.

A12—12 to 18 inches; dark grayish brown (10YR 4/2) clay, dark brown (10YR 3/3) moist; massive; very hard, firm, very sticky and very plastic; many very fine roots; many very fine tubular pores; many slickensides; moderately alkaline (pH 8.0); clear smooth boundary.

C1ca—18 to 23 inches; brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; few spots of reddish brown (5YR 5/4) moist; massive; very hard, firm, very sticky and very plastic; many very fine roots; many very fine tubular pores; a few dark grayish brown streaks from the Ap horizon extend through this horizon; many slickensides; slightly effervescent in matrix and strongly effervescent in commmon soft lime masses; moderately alkaline (pH 8.0); clear smooth boundary.

C2ca—23 to 30 inches; brown (7.5YR 4/2) and reddish brown (5YR 5/4) clay, dark brown (7.5YR 3/2) and reddish brown (5YR 4/4) moist; massive; very hard, firm, very sticky and very plastic; commmon very fine roots; many very fine tubular pores; few dark grayish brown streaks from Ap horizon extend through this horizon; many slickensides; slightly effervescent in the matrix and strongly effervescent in common soft lime masses; moderately alkaline (pH 8.2); clear smooth boundary.

C3ca—30 to 37 inches; reddish brown (5YR 5/4) sandy clay, brown (7.5YR 4/4) moist; massive; very hard, firm, sticky and very plastic; common very fine roots; many very fine tubular pores; few dark grayish brown streaks (1/4 to 2 1/2 cm wide) from Ap horizon extends 4 inches into this horizon; strongly effervescent in matrix and violently effervescent in common soft lime masses (1 to 5 cm); moderately alkaline (pH 8.2); clear wavy boundary.

IIC4r—37 inches; brown (7.5YR 4/4) highly weathered feldspathic sandy material that is massive and hard when dry but crumbles in water and crushes to a sandy loam; many fine pores; moderately alkaline (pH 8.0).

This soil has paralithic contact at a depth of 20 to 40 inches.

The A horizon is very dark grayish brown, dark grayish brown, grayish brown, brown, dark brown, dark reddish brown, or reddish brown (10YR 3/2, 4/2, 5/2, or 4/3; 7.5YR 3/2 or 4/2; 5YR 3/3, 4/3, or 3/4). It is slightly acid through moderately alkaline. The C horizon is brown, dark reddish gray, reddish brown, or dark reddish brown (7.5YR 4/2, 4/4, or 5/4, 5YR 4/2, 4/3, 5/3, 3/4, 4/4, or 5/4). It is clay or sandy clay and has common to many slickensides. It is mildly alkaline or moderately alkaline. The Cr horizon is composed of highly weathered feldspathic sandy material that is yellowish brown (10YR 5/4 or 5/6; 7.5YR, 4/4, or 5/4). This material breaks down to sand through sandy clay loam.

Cibo series

The Cibo series consists of moderately deep, well drained soils that formed in material weathered from gabbro. Cibo soils are on uplands. Slope ranges from 15 to 50 percent. Mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F.

Cibo soils are similar to the Centerville, Porterville, and Seville soils. They are near the Las Posas, Porterville, and Trabuco soils. Centerville and Las Posas soils have paralithic contact at a depth of 20 to 40 inches. Porterville soils do not have paralithic contact and are more than 40 inches deep. Seville soils have a duripan at a depth of 20 to 40 inches. Trabuco soils have paralithic contact at a depth of 40 to 60 inches.

A typical pedon of Cibo clay, 15 to 30 percent slopes, is located about 6 1/2 miles east of Lindsay, 2,700 feet west and 250 feet south of the northeast corner of sec. 18, T. 20 S., R. 28 E.; Frazier Valley Quadrangle:

A11—0 to 8 inches; brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure, 1/2 inch granular layer on the surface; very hard, firm, very sticky and very plastic; many very fine roots; many very fine tubular pores; neutral (pH 6.8); gradual smooth boundary.

A12—8 to 19 inches; brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; moderate coarse subangular blocky structure; very hard, firm, very sticky and very plastic; many fine roots; many very fine and fine tubular pores; many slickensides; 3 percent gravel; neutral (pH 7.0); clear smooth boundary.

C—19 to 35 inches; reddish brown (5YR 5/4) clay, dark reddish brown (5YR 3/4) moist; moderate coarse angular blocky structure; very hard, firm, very sticky and very plastic; common very fine roots; common very fine tubular pores; many slickensides; 3 percent gravel; neutral (pH 7.0); clear irregular boundary.

R—35 inches; light brownish gray (2.5Y 6/2) and grayish brown (2.5Y 5/2) hard fractured gabbro.

This soil is 20 to 40 inches deep to lithic contact. It is from 0 to 5 percent gravel.

The A horizon is brown, dark brown, dark grayish brown, or very dark grayish brown (7 5YR 4/2 or 3/2; 10YR 4/2, 4/3, or 3/2). It is slightly acid to moderately alkaline. The C horizon is reddish brown, brown, or dark brown (5YR 5/4, 4/3, or 4/4; 10YR 3/3 or 4/3). It is neutral to moderately alkaline. In some pedons this C horizon is calcareous. The R horizon is moderately hard or hard, fractured gabbro. In places the gabbro is coated with lime.

Cieneba series

The Cieneba series consists of shallow, somewhat excessively drained soils that formed in material weathered from granitic rock. Cieneba soils are on uplands. Slope ranges from 15 to 75 percent. Mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F.

Cieneba soils are similar to the Vista soils. They are near the Blasingame, Fallbrook, Friant, Sesame, Vista, and Walong soils. Vista soils have a cambic horizon and have paralithic contact at a depth of 20 to 40 inches. Blasingame and Sesame soils have an argillic horizon and paralithic contact at a depth of 20 to 40 inches. Fallbrook soils have an argillic horizon and paralithic contact at a depth of 40 to 60 inches. Friant soils have a mollic epipedon, and they have lithic contact at a depth of 10 to 20 inches. Walong soils have a mollic epipedon, and they have paralithic contact at a depth of 20 to 40 inches.

A typical pedon of Cieneba coarse sandy loam in an area of Cieneba-Rock outcrop complex, 15 to 75 percent slopes, located about 1/4 mile north of Springville, 2,600 feet east and 2,450 feet north of the southwest corner of sec 35, T. 20 S., R. 29 E ; Springville Quadrangle·

A11—0 to 5 inches; light brownish gray (10YR 6/2) coarse sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine interstitial pores; medium acid (pH 5.8); gradual smooth boundary.

A12—5 to 16 inches; light brownish gray (10YR 6/2) coarse sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine and fine interstitial pores; 5 percent gravel; medium acid (pH 5.8); clear smooth boundary.

Cr—16 inches; variable colored and strongly weathered granitic rock.

This soil has paralithic contact with weathered granitic rock at a depth of 10 to 20 inches. It is from 0 to 5 percent gravel. It is medium acid or slightly acid.

The A horizon is brown or light brownish gray (10YR 5/3 or 6/2).

Clear Lake series

The Clear Lake series consists of very deep, poorly drained soils that formed in alluvium, mainly from granitic sources. Clear Lake soils are on alluvial fans. Slope ranges from 0 to 2 percent. Mean annual precipitation is about 12 inches, and the mean annual air temperature is about 62 degrees F

Clear Lake soils are similar to the Porterville soils. They are near the Grangeville and Porterville soils. Porterville soils are well drained. In most places the pedon has a dark reddish brown surface layer. Grangeville soils have a coarse-loamy control section and have a mollic epipedon.

A typical pedon of Clear Lake clay, drained, is located about 7 1/2 miles east of Orosi, 2,400 feet north and 2,100 feet west of the southeast corner of sec 16, T. 16 S., R. 26 E.; Stokes Mountain Quadrangle:

A1—0 to 24 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; strong coarse angular blocky structure; very hard, firm, very sticky and very plastic; common very fine and few fine roots; common very fine and medium grayish brown mottles; cracks 1/4 to 3/4 inch wide, 8 to 12 inches deep; few slickensides; neutral (pH 7.3); clear wavy boundary.

C1ca—24 to 36 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; common fine and medium grayish brown mottles, moist; massive; very hard, firm, very sticky and very plastic; few very fine and fine roots; common very fine and fine tubular pores; common slickensides; slightly effervescent in matrix and in mottles; mildly alkaline (pH 7.8); clear irregular boundary.

C2ca—36 to 66 inches; gray (10YR 5/1) clay; dark gray (10YR 4/1) moist; massive; very hard, firm, very sticky and very plastic; common slickensides; many light brownish gray lime nodules; the lime nodules are violently effervescent and the matrix is strongly effervescent; moderately alkaline (pH 8.0).

This soil is more than 60 inches deep.

The A horizon is dark gray or very dark gray (10YR 4/1 or 3/1). Reaction is slightly acid or neutral. The C horizon is dark gray, gray, dark grayish brown, or brown (10YR 4/1, 5/1, or 4/2; 7.5YR 4/4). It is mildly alkaline or moderately alkaline.

Coarsegold series

The Coarsegold series consists of moderately deep, well drained soils that formed in material weathered from mica schist. Coarsegold soils are on uplands. Slope ranges from 15 to 50 percent. Mean annual precipitation is about 20 inches, and the mean annual air temperature is about 61 degrees F.

Coarsegold soils are similar to the Blasingame, Fallbrook, and Sesame soils. They are near the Auberry, Blasingame, Friant, and Las Posas soils. Blasingame soils have less organic matter in the A horizon than Coarsegold soils. Auberry and Fallbrook soils have paralithic contact at a depth of 40 to 60 inches. Sesame soils have a hue of 10YR in the argillic horizon. Friant soils have lithic contact at a depth of 10 to 20 inches. Las Posas soils have a hue of 2.5YR throughout the argillic horizon.

A typical pedon of Coarsegold loam, 30 to 50 percent slopes, is located about 10 miles northeast of Orosi,

1,300 feet west and 2,100 feet south of the northeast corner of sec. 8, T. 15 S., R 26 E., Tucker Mountain Quadrangle:

A1—0 to 7 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine and few medium roots; many fine tubular pores; slightly acid (pH 6.2); clear smooth boundary.

B1t—7 to 14 inches; reddish brown (5YR 4/4) heavy loam, dark reddish brown (5YR 3/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine and fine tubular pores; few thin clay films lining pores and on faces of peds; slightly acid (pH 6 2); clear smooth boundary.

B21t—14 to 20 inches; reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; few fine and medium roots; many very fine and fine tubular pores; many thin clay films lining pores and on faces of peds; 8 percent gravel; slightly acid (pH 6.4); clear smooth boundary.

B22t—20 to 31 inches, reddish brown (5YR 4/4) gravelly clay loam, dark reddish brown (5YR 3/4) moist; moderate medium angular blocky structure; very hard, firm, sticky and plastic; few fine and medium roots; many very fine and fine tubular pores; continuous moderately thick clay films lining pores and on faces of peds; 20 percent gravel; slightly acid (pH 6.4); clear wavy boundary.

Cr—31 inches; weathered mica schist; some reddish brown clay loam in fractures.

This soil has paralithic contact at a depth of 20 to 40 inches. It is from 5 to 20 percent gravel.

The A horizon is brown or grayish brown (10YR 5/3 or 5/2; 7.5YR 5/4 or 4/4). It is slightly acid or neutral. The B2t horizon is reddish brown, yellowish red, or dark red (5YR 4/4, 5/4, or 4/6; 2.5YR 4/6 or 3/6). It is sandy clay loam, clay loam, or gravelly clay loam. Reaction is slightly acid or neutral. The Cr horizon is moderately or strongly weathered mica schist, quartzite, or gneiss.

Crouch series

The Crouch series consists of deep, well drained soils that formed in material weathered from quartz diorite. Crouch soils are on uplands. Slope ranges from 15 to 50 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 55 degrees F.

Crouch soils are similar to the Sheephead and Walong soils. They are near the Auberry, Holland, and Sheephead soils. Auberry soils have an argillic horizon and a soil temperature at a depth of 20 inches that is more than 59 degrees F. Holland soils have a hue of 5YR in some parts of the argillic horizon. Sheephead soils have paralithic contact at a depth of less than 20 inches. Walong soils have paralithic contact at a depth of 20 to 40 inches.

A typical pedon of Crouch coarse sandy loam, 30 to 50 percent slopes, is located on the Tule River Indian Reservation, 1,800 feet south and 900 feet east of the projected northwest corner of sec. 30, T. 21 S., R. 31 E.; Camp Nelson S.W. Quadrangle:

O1—3 inches to 2; dried litter of oak leaves and pine needles.

O2—2 inches to 0; partially decomposed pine needles and oak leaves.

A11—0 to 5 inches; dark grayish brown (10YR 4/2) coarse sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and few fine roots; many very fine and fine interstitial pores; 2 percent gravel; slightly acid (pH 6.5); gradual smooth boundary.

A12—5 to 16 inches; dark grayish brown (10YR 4/2) coarse sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, common fine, and few medium and coarse roots; many very fine and fine interstitial pores; 2 percent gravel; slightly acid (pH 6.3); gradual wavy boundary.

A13—16 to 22 inches; grayish brown (10YR 5/2) coarse sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, common fine, and few medium roots; many very fine and fine interstitial pores; 2 percent gravel; medium acid (pH 6.0); clear irregular boundary.

B2—22 to 43 inches; pale brown (10YR 6/3) coarse sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine, common fine, and few medium roots; many very fine interstitial pores and few fine tubular pores; few thin clay films lining pores and bridging sand grains; 2 percent gravel; slightly acid (pH 6.3); gradual smooth boundary.

C1—43 to 70 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common very fine interstitial and few very fine tubular pores; 5 percent gravel; slightly acid (pH 6.4); abrupt irregular boundary.

C2r—70 inches; light gray, strongly weathered quartz diorite; easily excavated and crushed to coarse sand.

This soil has paralithic contact at a depth of 40 to 80 inches It is from 0 to 5 percent gravel. It is more than 1 percent organic matter to a depth of 10 inches or more. The organic matter decreases regularly to less than 1 percent at a depth of 20 inches.

The A horizon is very dark gray, very dark grayish brown, dark gray, dark grayish brown, grayish brown, or brown (10YR 3/1, 3/2, 4/1, 4/2, 5/2, or 5/3). It is slightly acid or medium acid. The B2 horizon is pale brown, light yellowish brown, or very pale brown (10YR 6/3, 6/4, or 7/4) sandy loam or coarse sandy loam. It is slightly acid or medium acid. The Cr horizon is quartz diorite or granodiorite.

Exeter series

The Exeter series consists of well drained soils that are moderately deep to a duripan. Exeter soils formed in alluvium, mainly from granitic sources on terraces. Slope ranges from 0 to 9 percent. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F.

Exeter soils are similar to the San Joaquin soils. They are near the Centerville, Greenfield, Havala, Lewis, Porterville, San Joaquin, Seville, and Wyman soils. San Joaquin and Lewis soils have a fine-textured argillic horizon. Centerville, Porterville, and Seville soils are vertisols. Greenfield, Havala, and Wyman soils do not have the duripan that the Exeter soils have.

A typical pedon of Exeter loam, 0 to 2 percent slopes, is located about 1/2 mile north of Ducor, 450 feet east and 500 feet north of the center of sec. 27, T. 23 S., R. 27 E.; Ducor Quadrangle:

Ap—0 to 7 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; neutral (pH 6.8); gradual smooth boundary.

A3—7 to 14 inches; dark yellowish brown (10YR 4/4) loam, dark yellowish brown (10YR 3/4) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; neutral (pH 7.0); gradual smooth boundary.

B1—14 to 20 inches; brown (7.5YR 4/4) loam, dark reddish brown (5YR 3/4) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; few thin clay films lining pores and bridging sand grains; mildly alkaline (pH 7.5); clear smooth boundary.

B21t—20 to 25 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; massive; hard, firm, sticky and plastic; many very fine roots; many very fine and few fine tubular pores; few thin clay films lining pores and bridging sand grains; mildly alkaline (pH 7.8); gradual smooth boundary.

B22t—25 to 30 inches; yellowish red (5YR 5/6) clay loam, yellowish red (5YR 4/6) moist; massive; hard, firm, sticky and plastic; many very fine roots; many very fine and few fine tubular pores; common moderately thick clay films lining pores and bridging sand grains; mildly alkaline (pH 7.8); abrupt wavy boundary.

C1sim—30 to 43 inches; reddish brown (5YR 5/4) duripan, reddish brown (5YR 4/4) moist; does not soften or crumble after prolonged soaking in water and can be chipped by hand tools with extreme difficulty; many very fine tubular pores; light brown (7.5YR 6/4) 1 to 3 mm silica layer caps the surface of the duripan; moderately alkaline (pH 7.8); abrupt wavy boundary.

C2—43 to 47 inches; light yellowish brown (10YR 6/4) sand, yellowish brown (10YR 5/4) moist; single grain; loose, nonsticky and nonplastic; 14 percent gravel; strongly effervescent; moderately alkaline (pH 8.0); gradual smooth boundary.

C3—47 to 60 inches; light yellowish brown (10YR 6/4) gravelly coarse sand, yellowish brown (10YR 5/4) moist; single grain; loose, nonsticky and nonplastic; 17 percent gravel; moderately alkaline (pH 8.0).

This soil has a duripan at a depth of 20 to 40 inches. It is from 0 to 10 percent gravel throughout. It is slightly acid to moderately alkaline.

The A horizon is light brownish gray, grayish brown, brown, yellowish brown or dark yellowish brown (10YR 6/2, 5/2, 5/3, 5/4, or 4/4; 7.5YR 5/4 or 4/4). The Bt horizon is brown, reddish brown, or yellowish red (7.5YR 5/4 or 4/4; 5YR 4/4, 5/3, 5/4, or 5/6). It is loam, sandy clay loam, or clay loam. The duripan is pale brown, yellowish brown, brown, or reddish brown (10YR 6/3 or 5/4; 7.5YR 5/4; 5YR 5/4, 5/3, or 4/4). It is from 6 to 30 inches thick.

Fallbrook series

The Fallbrook series consists of deep, well drained soils that formed in material weathered from quartz diorite (fig. 8). Fallbrook soils are on uplands. Slope ranges from 9 to 50 percent. Mean annual precipitation is about 16 inches, and the mean annual air temperature is about 61 degrees F.

Fallbrook soils are similar to Auberry, Blasingame, Coarsegold, Holland, and Sesame soils. They are near Auberry, Blasingame, Cieneba, and Vista soils. Auberry soils have base saturation of less than 75 percent in the argillic horizon. Blasingame, Coarsegold, Sesame, and Vista soils have paralithic contact at a depth of below 20 to 40 inches. Holland soils have more organic matter in the upper part of the A horizon and a soil temperature of less than 59 degrees F at a depth of 20 inches. Cieneba soils have paralithic contact at a depth of less than 20 inches.

A typical pedon of Fallbrook sandy loam, 15 to 30 percent slopes, is located about 5 miles north of Springville, 950 feet east and 900 feet north of the southwest corner of sec. 4, T. 20 S., R. 29 E.; Springville Quadrangle:

A1—0 to 8 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, very friable, slightly sticky and

Figure 8.—A profile of Fallbrook sandy loam.

slightly plastic; many very fine roots; common very fine tubular pores; slightly acid (pH 6.3); clear wavy boundary.

B1t—8 to 16 inches; reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/3) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and plastic; many very fine roots; common very fine and fine tubular pores; slightly acid (pH 6.5); gradual smooth boundary.

B21t—16 to 21 inches; reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; moderate coarse subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; many very fine and few fine tubular pores; common thin clay films on faces of peds and lining pores; 2 percent gravel; neutral (pH 6.7) gradual smooth boundary.

B22t—21 to 33 inches; reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; moderate medium subangular blocky structure; very hard, very firm, sticky and plastic; few very fine roots; many very fine tubular pores; many moderately thick clay films on faces of peds and common moderately thick clay films lining pores; 2 percent gravel; neutral (pH 7.0); clear wavy boundary.

B3—33 to 51 inches; reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; common very fine tubular pores; common moderately thick clay films on faces of peds and many thin clay films lining pores; 2 percent gravel; neutral (pH 7.3); abrupt wavy boundary.

Cr—51 inches; strongly weathered quartz diorite.

This soil has paralithic contact at a depth of 40 to 60 inches. It is from 0 to 5 percent gravel. It is slightly acid or neutral.

The A horizon is brown or yellowish brown (10YR 4/3, 5/3, or 5/4; 7.5YR 5/4 or 4/4). The B2t horizon is brown or reddish brown (5YR 4/4 or 5/4; 7.5YR 5/4 or 6/4) loam, sandy clay loam, or clay loam. The Cr horizon is moderately weathered or strongly weathered quartz diorite or grandiorite.

Friant series

The Friant series consists of shallow, well drained soils that formed in material weathered from mica schist. Friant soils are on uplands. Slope ranges from 15 to 75 percent. Mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F.

Friant soils are similar to the Sheephead soils. They are near the Coarsegold, Cieneba, and Vista soils. Sheephead and Cieneba soils have paralithic contact at a depth of 10 to 20 inches. Coarsegold and Vista soils have paralithic contact at a depth of 20 to 40 inches.

A typical pedon of Friant fine sandy loam is in an area of Friant-Rock outcrop complex, 15 to 75 percent slopes, and is located about 1 3/4 miles northeast of Lemon Cove, 2,660 feet north and 1,660 feet east of the southwest corner of sec. 25, T. 17 S., R. 27 E.; Woodlake Quadrangle:

A11—0 to 7 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine tubular and interstitial pores; 10 percent gravel; slightly acid (pH 6.3); clear wavy boundary.

A12—7 to 18 inches; brown (10YR 5/3) gravelly fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine tubular and interstitial pores; 5 percent cobbles and 25 percent gravel; slightly acid (pH 6.3) abrupt irregular boundary.

R—18 inches; hard slightly weathered mica schist.

This soil has lithic contact at a depth of 10 to 20 inches. It is from 5 to 30 percent rock fragments. It is medium acid through neutral.

The A horizon is dark grayish brown, brown, or yellowish brown (10YR 4/2, 4/3, 5/3, or 5/4).

Grangeville series

The Grangeville series consists of very deep, somewhat poorly drained soils that formed in alluvium, derived mainly from granitic sources. Grangeville soils are on alluvial fans. Slope ranges from 0 to 2 percent The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F.

Grangeville soils are similar to the Yettem soils. They are near the Clear Lake, Tujunga, and Yettem soils. Yettem soils are well drained. Clear Lake soils have a fine-textured control section. Tujunga soils have a sandy control section.

A typical pedon of Grangeville silt loam, drained, is located about 2 miles south of Woodlake, 1,500 feet north and 2,300 feet east of the southwest corner of sec. 1, T. 18 S., R. 26 E.; Woodlake Quadrangle·

A11—0 to 6 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist, weak medium granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine interstitial pores; strong effervescence from disseminated lime; moderately alkaline (pH 8.0); gradual smooth boundary.

A12—6 to 14 inches; grayish brown (10YR 5/2) silt loam, dark brown (10YR 3/3) moist; weak medium granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and few fine roots; many very fine tubular pores; strong effervescence from disseminated lime; moderately alkaline (pH 8.0); abrupt wavy boundary.

C1—14 to 18 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; common medium prominent strong brown (7.5YR 5/6) mottles; moderate thin platy structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and common fine roots; common very fine tubular pores; slight effervescence from disseminated lime; mildly alkaline (pH 7.5); abrupt wavy boundary.

C2—18 to 23 inches, grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; common medium distinct brown (7YR 4/4) mottles; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and common fine roots; many very fine tubular pores; mildly alkaline (pH 7 5); abrupt wavy boundary.

C3—23 to 27 inches; light brownish gray (10YR 6/2) loamy sand, dark grayish brown (10YR 4/2) moist; common medium distinct brown (7.5YR 4/4) mottles; single grain; loose, nonsticky and nonplastic; many very fine and common fine roots, few very fine tubular pores; mildly alkaline (pH 7.5); abrupt smooth boundary

C4—27 to 28 inches, grayish brown (10YR 5/2) silt loam, dark brown (10YR 3/3) moist; common medium prominent yellowish red (5YR 5/6) mottles; weak medium granular structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and many fine roots; many very fine tubular pores; moderately alkaline (pH 8.0); abrupt smooth boundary.

C5—28 to 64 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine tubular pores; mildly alkaline (pH 7.5).

This soil is more than 60 inches deep. Organic matter decreases irregularly with depth.

The A horizon is dark grayish brown or grayish brown (10YR 4/2 or 5/2). It is mildly alkaline or moderately alkaline. In some pedons the A horizon is noncalcareous in the upper part. The C horizon is grayish brown, brown, light brownish gray, or pale brown (10YR 5/2, 5/3, 6/2, or 6/3). It is stratified sandy loam, loam, silt loam, or loamy sand. It is neutral to moderately alkaline.

Greenfield series

The Greenfield series consists of very deep, well drained soils that formed in alluvium, mainly from granitic sources. Greenfield soils are on alluvial fans. Slope ranges from 0 to 5 percent. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F.

Greenfield soils are similar to the Honcut and Wyman soils. They are near the Exeter and Honcut soils. Honcut soils do not have an argillic horizon. Exeter soils have a duripan at a depth of 20 to 40 inches. Wyman soils have a fine-loamy control section.

A typical pedon of Greenfield sandy loam, 0 to 2 percent slopes, is located about 6 1/2 miles east of Seville, 2,000 feet north and 300 feet east of the southwest corner of sec. 29, T. 16 S., R. 26 E.; Stokes Mountain Quadrangle:

Ap—0 to 10 inches; brown (10YR 5/3) sandy loam, dark yellowish brown (10YR 3/4) moist; massive; hard, very friable, nonsticky and nonplastic; many very fine roots and common fine and medium roots; common very fine interstitial pores; 2 percent gravel; slightly acid (pH 6.5); gradual smooth boundary.

B1—10 to 18 inches; dark yellowish brown (10YR 4/4) sandy loam, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine, common fine, and medium roots and few coarse roots; many very fine tubular pores; 2 percent gravel; slightly acid (pH 6.5), gradual smooth boundary.

B21t—18 to 38 inches; brown (7.5YR 4/4) sandy loam, dark yellowish brown (10YR 3/4) moist; weak coarse subangular blocky structure, slightly hard, very friable, slightly sticky and nonplastic; many very fine, common fine, and few medium roots; many

very fine and common fine tubular pores; many moderately thick clay films lining pores and bridging sand grains and few thin clay films on faces of peds; 2 percent gravel; neutral (pH 6 7); gradual smooth boundary.

B22t—38 to 49 inches; brown (7.5YR 4/4) sandy loam, dark yellowish brown (10YR 3/4) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common very fine and common fine tubular pores; many moderately thick clay films lining pores and bridging sand grains and few thin clay films on faces of peds; 2 percent gravel; mildly alkaline (pH 7.5); gradual smooth boundary.

C—49 to 70 inches; brown (7.5YR 4/4) sandy loam, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine and common fine tubular pores; 2 percent gravel; mildly alkaline (pH 7.6).

This soil is more than 60 inches deep. It is from 0 to 5 percent gravel.

The A horizon is brown, light brownish gray, or pale brown (10YR 5/3, 6/2, or 6/3). It has less than 0.7 organic carbon. It is slightly acid or neutral. The B2t horizon is grayish brown or brown (10YR 5/2 or 5/3; 7.5YR 4/4). It is sandy loam or fine sandy loam that is less than 18 percent clay. It is slightly acid to mildly alkaline. The C horizon is light brownish gray, light yellowish brown, or brown (10YR 6/2 or 6/4; 7.5YR 4/2 or 4/4). It is sandy loam or coarse sandy loam. It is neutral or mildly alkaline.

Havala series

The Havala series consists of very deep, well drained soils that formed in alluvium, derived mainly from granitic rock. Havala soils are on alluvial fans. Slope ranges from 0 to 5 percent. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F.

Havala soils are similar to the Yettem soils. They are near the Exeter, Honcut, and Yettem soils. Honcut and Yettem soils have a coarse loamy control section and do not have an argillic horizon. Exeter soils have a duripan at a depth of 20 to 40 inches.

A typical pedon of Havala loam, 2 to 5 percent slopes, is located about 1/2 mile north of Terra Bella, 200 feet east and 400 feet south of the center of sec. 34, T. 22 S., R. 27 E.; Ducor Quadrangle:

Ap—0 to 10 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate coarse granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine, common fine, and few medium tubular pores; slightly acid (pH 6.3); gradual smooth boundary.

A3—10 to 16 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak coarse granular structure; slightly hard, very friable, slightly sticky and slightly plastic, many very fine roots; many very fine and common fine tubular pores; slightly acid (pH 6 5), gradual smooth boundary.

B1—16 to 30 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure; hard, friable, sticky and slightly plastic; common very fine roots; common very fine tubular pores; neutral (pH 6.8); clear smooth boundary

B2t—30 to 45 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure; hard, friable, sticky and plastic; common very fine roots, common very fine tubular pores; common thin clay films bridging sand grains; neutral (pH 7.0); clear smooth boundary.

B3—45 to 56 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; common very fine tubular pores; neutral (pH 7.3); clear smooth boundary.

C—56 to 64 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine tubular pores; strong effervescence from disseminated lime; moderately alkaline (pH 8.0).

The solum of this soil ranges from 40 to 60 inches in thickness. The soil is from 0 to 5 percent gravel.

The A horizon is dark grayish brown, grayish brown, or brown (10YR 4/2, 5/2, or 5/3). It is slightly acid or neutral. The B2t horizon is brown or yellowish brown (10YR 5/3 or 5/4; 7.5YR 5/2). It is loam, sandy clay loam, or clay loam. It is neutral but becomes more alkaline with increasing depth.

Holland series

The Holland series consists of very deep, well drained soils that formed in material weathered from quartz diorite. Holland soils are on uplands. Slope ranges from 15 to 50 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 55 degrees F.

The Holland soils are similar to Auberry and Fallbrook soils. They are near the Auberry, Crouch, and Sheephead soils. Auberry soils have a mean annual soil temperature above 59 degrees F at a depth of 20 inches. Fallbrook soils have base saturation of more than 75 percent and a mean annual soil temperature above 59 degrees F at a depth of 20 inches. Crouch soils have a mollic epipedon and do not have an argillic horizon. Sheephead soils have paralithic contact at a depth of 10 to 20 inches.

A typical pedon of Holland loam, 15 to 30 percent slopes, is located about 2 miles south of Hartland, 1,700 feet east and 3,400 feet north of the southeast corner of sec 17, T. 15 S , R. 28 E.; Giant Forest S W. Quadrangle

O1—2 inches to 0 , dried leaf, twig, and grass litter.
A11—0 to 3 inches, grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; many very fine tubular pores; medium acid (pH 6.0); clear wavy boundary.
A12—3 to 11 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic, many fine and few coarse roots; many fine tubular pores; slightly acid (pH 6.4); clear smooth boundary.
A3—11 to 19 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; massive, slightly hard, very friable, slightly sticky and slightly plastic; many fine and common medium roots; many fine and common medium tubular pores; slightly acid (pH 6.3); gradual wavy boundary.
B1—19 to 29 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many medium roots; many medium and fine tubular pores; few thin clay films on faces of peds; slightly acid (pH 6.1); gradual smooth boundary.
B21t—29 to 47 inches; reddish brown (5YR 5/3) clay loam, dark reddish brown (5YR 3/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; many medium roots; many fine and very fine tubular pores; common thin clay films on faces of peds; 5 percent gravel; medium acid (pH 6.0); gradual smooth boundary.
B22t—47 to 64 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few medium and fine roots; common and very fine tubular pores; common thin clay films on faces of peds; 10 percent gravel; medium acid (pH 5.6); gradual smooth boundary.
B3—64 to 80 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic, few medium and fine roots; common very fine tubular pores; medium acid (pH 6.0); clear wavy boundary.
Cr—80 inches; very pale brown (10YR 7/3) strongly weathered quartz diorite, crushes easily to sandy loam.

This soil has paralithic contact at a depth of 60 to 80 inches It is from 0 to 10 percent gravel.

The A horizon is dark grayish brown, brown, or grayish brown (10YR 4/2, 4/3, 5/2, or 5/3; 7.5YR 5/4). It is medium acid or slightly acid. Base saturation is 35 to 50 percent. The B2t horizon is brown and reddish brown (7.5YR 4/4 or 5/4, 5YR 4/4 or 5/3). It is clay loam or sandy clay loam that is medium acid or strongly acid.

Honcut series

The Honcut series consists of very deep, well drained soils that formed in alluvium, derived mainly from granitic sources Honcut soils are on alluvial fans. Slope ranges from 0 to 5 percent. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F.

Honcut soils are similar to the Greenfield, San Emigdio, and Tujunga soils. They are near the Greenfield, Havala, San Emigdio, Tujunga, and Yettem soils. Greenfield and Havala soils have an argillic horizon. San Emigdio soils are calcareous in the upper 20 inches, and organic matter decreases irregularly with depth. Tujunga soils have a sandy control section. Yettem soils have a mollic epipedon.

A typical pedon of Honcut sandy loam, 0 to 2 percent slopes, is located about 2 miles north of Orosi, 1,600 feet east and 100 feet north of the southwest corner of sec 32, T. 15 S., R. 25 E.; Orange Cove South Quadrangle:

Ap—0 to 11 inches; brown (10YR 5/3) sandy loam, dark yellowish brown (10YR 3/4) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and few fine roots; many very fine interstitial pores; 2 percent gravel; slightly acid (pH 6.5); clear smooth boundary.
C1—11 to 29 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; massive; hard, very friable, nonsticky and nonplastic; many very fine and common fine roots; common very fine tubular pores; 2 percent gravel; neutral (pH 7.3); gradual smooth boundary.
C2—29 to 43 inches; brown (10YR 5/3) sandy loam, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine, few fine, and few medium roots; common very fine tubular pores; 2 percent gravel; mildly alkaline (pH 7.5); gradual smooth boundary.
C3—43 to 50 inches; brown (10YR 5/3) sandy loam, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine and few fine roots; many very fine tubular pores; 2 percent gravel; slight effervescence from lime concentrated in seams; mildly alkaline (pH 7.8); gradual smooth boundary.
C4—50 to 70 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 4/3) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic, common very fine and fine roots; many very fine tubular pores; 2 percent gravel; strong effervescence from disseminated lime, mildly alkaline (pH 7.8)

This soil is more than 60 inches deep. It is from 0 to 10 percent gravel.

The A horizon is grayish brown or brown (10YR 5/2 or 5/3). It is slightly acid or neutral. The C horizon is brown or pale brown (10YR 5/3 or 6/3) sandy loam or coarse sandy loam. It is neutral or mildly alkaline.

Las Posas series

The Las Posas series consists of moderately deep, well drained soils that formed in material weathered from gabbro. Las Posas soils are on uplands. Slope ranges from 9 to 50 percent. Mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F.

Las Posas soils are similar to the Trabuco soils. They are near the Cibo, Coarsegold, Sesame, and Trabuco soils. Trabuco soils have more than 2 percent organic matter to a depth of 7 inches, and some parts of the argillic horizon have hues of 5YR or yellower. Cibo soils are vertisols. Coarsegold soils have a fine-loamy argillic horizon. Sesame soils have a brown argillic horizon and a fine-loamy control section.

A typical pedon of Las Posas loam, 30 to 50 percent slopes, is located about 8 miles west of Badger, 1,450 feet west and 600 feet north of the southeast corner of sec. 9, T. 15 S., R. 26 E.; Tucker Mountain Quadrangle:

A1—0 to 3 inches; reddish brown (5YR 4/4) loam, dark reddish brown (5YR 3/4) moist; weak medium granular structure; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine tubular pores; 2 percent cobbles and 5 percent gravel; slightly acid (pH 6.5); clear smooth boundary.

A3—3 to 9 inches; reddish brown (5YR 4/4) loam, dark reddish brown (5YR 3/4) moist; moderate medium angular blocky structure; hard, friable, sticky and plastic; many very fine roots; common very fine tubular pores; 5 percent gravel; neutral (pH 7.0); clear wavy boundary.

B2t—9 to 25 inches; dark red (2.5YR 3/6 dry and moist) clay; strong medium angular blocky structure; very hard, very firm, very sticky and very plastic; many very fine roots; common very fine tubular pores; continuous thick clay films on faces on peds; 5 percent gravel; neutral (pH 7.0); clear wavy boundary.

B3—25 to 32 inches; dark red (2.5YR 3/6 dry and moist) clay loam; strong medium angular blocky structure; very hard, firm, very sticky and plastic; few very fine roots; moderately thick clay films on faces of peds; 5 percent gravel; mildly alkaline (pH 7.8); clear wavy boundary.

Cr—32 inches; light brownish gray (10YR 6/2) weathered gabbro; mildly alkaline (pH 7.0).

This soil has paralithic contact at a depth of 20 to 40 inches. It is from 0 to 15 percent gravel and ranges from 0 to 5 percent cobbles.

The A horizon is reddish brown or brown (5YR 4/3 or 4/4; 7.5YR 4/2, 4/4, or 5/4). It is slightly acid or neutral. The B2t horizon is dark reddish brown, reddish brown, or dark red (2.5YR 3/4, 4/4, or 3/6) heavy clay loam or clay. It is neutral or mildly alkaline.

Lewis series

The Lewis series consists of moderately well drained saline-alkali soils that are moderately deep to a duripan. Lewis soils formed in alluvium derived from mixed rock sources. They are in bowl-shaped depressions. Slope ranges from 0 to 2 percent. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F.

Lewis soils are similar to the San Joaquin soils. They are near the Exeter and San Joaquin soils. San Joaquin and Exeter soils do not have a natric horizon. Exeter soils also have a fine-loamy control section.

A typical pedon of Lewis clay loam is located about 3 1/2 miles north of Lindsay, 600 feet west and 300 feet south of the northeast corner of sec. 25, T. 19 S., R. 26 E.; Rocky Hill Quadrangle:

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; weak medium angular blocky structure; hard, friable, sticky and plastic; many very fine roots; few very fine tubular pores; strongly alkaline (pH 8.5); abrupt smooth boundary.

B21tca—6 to 17 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure; very hard, very firm, very sticky and very plastic; common very fine and fine tubular pores; many moderately thick clay films on faces of peds and continuous moderately thick clay films lining pores; many medium light gray soft lime masses, strongly effervescent in the matrix and violently effervescent in the soft masses; very strongly alkaline (pH 9.5); clear smooth boundary.

B22tca—17 to 29 inches; pale brown (10YR 6/3) clay, yellowish brown (10YR 5/4) moist; strong fine and medium angular blocky structure; very hard, very firm, very sticky and very plastic; common very fine and fine tubular pores; many moderately thick clay films on faces of peds and continuous moderately thick clay films lining pores; many large light gray soft lime masses, strongly effervescent in the matrix and violently effervescent in the soft masses; very strongly alkaline (pH 9.7); clear smooth boundary.

B3ca—29 to 38 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; massive; hard, firm, sticky and plastic; few fine tubular pores; many large light gray soft lime masses, strongly effervescent in the matrix and violently effervescent in the soft masses; very strongly alkaline (pH 9.7); abrupt smooth boundary.

C1casi—38 to 52 inches; light yellowish brown (10YR 6/4) lime-silica cemented duripan, weakly to strongly

cemented; slightly effervescent in the duripan and violently effervescent in the seams; very strongly alkaline (pH 9.5); abrupt smooth boundary.

C2—52 to 60 inches; light yellowish brown (10YR 6/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; slightly stratified with weakly compacted lenses; massive; hard, firm, sticky and plastic; common very fine tubular pores; 5 percent gravel; slightly effervescent in seams of the weakly compacted lenses; strongly alkaline (pH 8.5).

This soil is 20 to 40 inches deep to a duripan. It is moderately alkaline to very strongly alkaline.

The A horizon is grayish brown or light brownish gray (10YR 5/2 or 6/2). The B2t horizon is grayish brown, brown, yellowish brown, or pale brown (10YR 5/2, 5/3, 5/4, or 6/3) clay and heavy clay loam. The duripan ranges from 2 to 24 inches in thickness. The C2 horizon has variable colors and is stratified. It is sandy loam, sandy clay loam, or clay loam.

Porterville series

The Porterville series consists of very deep, well drained soils that formed in alluvium, derived mainly from basic igneous rock. Porterville soils are on alluvial fans. Slope ranges from 0 to 15 percent. Mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F.

Porterville soils are similar to the Centerville, Cibo, Clear Lake, and Seville soils. They are near the Centerville, Cibo, Clear Lake, Exeter, San Joaquin, Seville, and Wyman soils. Centerville soils have paralithic contact at a depth of 20 to 40 inches. Cibo soils have lithic contact at a depth of 20 to 40 inches. Clear Lake soils are poorly drained, and the pedons are dark gray and gray. Exeter, San Joaquin, and Seville soils have a duripan at a depth of 20 to 40 inches. Wyman soils have a fine loamy control section.

A typical pedon of Porterville clay, 0 to 2 percent slopes, is located about 5 1/2 miles east of Cutler, 1,900 feet north and 1,600 feet west of the southeast corner of sec. 30, T. 16 S., R. 26 E.; Stokes Mountain Quadrangle:

Ap—0 to 8 inches; brown (7.5YR 4/2) clay, dark reddish brown (5YR 3/2) moist; strong coarse angular blocky structure, 1/4 inch of fine granular structure on the surface; very hard, firm, very sticky and very plastic; many fine and medium roots; common fine tubular pores; neutral (pH 7.0); abrupt wavy boundary.

A12—8 to 32 inches; dark reddish brown (5YR 3/2) clay, dark reddish brown (5YR 3/3) moist; strong coarse angular blocky structure; very hard, firm, very sticky and very plastic; many fine roots; common fine tubular pores; many intersecting slickensides; cracks more than 1 cm wide when dry; mildly alkaline (pH 7.8); clear irregular boundary.

C1—32 to 60 inches; dark reddish gray (5YR 4/2) clay, dark reddish brown (5YR 3/3) moist; strong coarse angular blocky structure; very hard, firm, very sticky and very plastic; few fine roots; many fine tubular pores; many intersecting slickensides; slightly effervescent in matrix, strongly effervescent in seams and common fine soft lime masses; mildly alkaline (pH 7.8); clear smooth boundary.

C2—60 to 72 inches; dark reddish gray (5YR 4/2) sandy clay, dark reddish brown (5YR 3/3) moist; massive; very hard, very firm, sticky and plastic; few fine tubular pores; slightly effervescent in matrix, strongly effervescent in seams and common fine soft lime masses; moderately alkaline (pH 8.0).

This soil has a clay or sandy clay texture that ranges in depth from 40 inches to more than 60 inches. It is neutral to moderately alkaline. Alkalinity increases with depth.

The A horizon is brown, dark brown, or dark reddish brown (7.5YR 4/2 or 3/2; 5YR 3/2 or 3/3) clay or cobbly clay. It is from 0 to 5 percent gravel and 0 to 10 percent cobbles. Some pedons have 15 to 40 percent cobbles on the surface. In a few pedons the A horizon is slightly effervescent. The C horizon is dark brown, brown, light brown, dark reddish brown, reddish brown, dark reddish gray, or reddish gray (7.5YR 3/2, 4/2, 5/2, 5/4, or 6/4; 5YR 3/2, 3/3, 5/3, 4/2, or 5/2). It is clay or sandy clay. In a few pedons the C horizon is clay loam in the lower part. It is from 0 to 5 percent gravel and from 0 to 5 percent cobbles. A few pedons have gravel or conglormerate at a depth of more than 40 inches.

San Emigdio series

The San Emigdio series consists of very deep, well drained soils that formed in alluvium derived from sedimentary and granitic sources. San Emigdio soils are on alluvial fans. Slope ranges from 0 to 2 percent. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F.

San Emigdio soils are similar to the Honcut soils. They are near the Honcut and Tujunga soils. Honcut soils are not calcareous, and the organic matter decreases regularly with depth. Tujunga soils have a sandy control section.

A typical pedon of San Emigdio loam is located about 1 mile southwest of Porterville, 950 feet east and 5 feet south of the northwest corner of sec. 3, T. 22 S., R. 27 E.; Porterville Quadrangle:

Ap—0 to 10 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine, common fine, and few medium roots; many very fine and common fine tubular pores; strong effervescence from disseminated lime; moderately alkaline (pH 8.0); gradual smooth boundary.

C1—10 to 29 inches; brown (10YR 5/3) loam, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many very fine and few tubular pores; strongly effervescent, lime disseminated and in filaments; moderately alkaline (pH 8.0); clear smooth boundary.

C2—29 to 39 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; 1 percent gravel; strong effervescence from disseminated lime; moderately alkaline (pH 8.0); clear smooth boundary.

C3—39 to 66 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine and medium granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; 1 percent gravel; slight effervescence from disseminated lime; moderately alkaline (pH 8.0).

This soil is more than 60 inches deep. Organic matter decreases irregularly with depth. The soil is from 1 to 5 percent gravel. It is mildly or moderately alkaline.

The A horizon is pale brown or light brownish gray (10YR 6/3 or 6/2). It effervesces slightly to strongly because of the disseminated lime. The C horizon is brown, grayish brown, light brownish gray, or pale brown (10YR 5/3, 5/2, 6/2, or 6/3) loam, fine sandy loam, or sandy loam. The 10 to 40 inch control section has some stratification and averages less than 18 percent clay. It is slightly to strongly effervescent. Lime is disseminated or in filaments.

San Joaquin series

The San Joaquin series consists of well drained soils that are moderately deep to a duripan. San Joaquin soils formed in alluvium, derived mainly from acid igneous rock (fig. 9). They are on terraces. Slope ranges from 0 to 9 percent. The mean annual precipitation is about 12 inches, and the mean annual air temperature is about 63 degrees F.

San Joaquin soils are similar to the Exeter and Lewis soils. They are near the Centerville, Exeter, Lewis, Porterville, Seville, and Wyman soils. Exeter soils have a fine-loamy argillic horizon. Lewis soils have a natric horizon. Centerville, Porterville, and Wyman soils do not have a duripan. Centerville, Porterville, and Seville soils are vertisols.

A typical pedon of San Joaquin loam, 2 to 9 percent slopes, is located about 1 mile north of Woodlake, 1,000 feet north and 200 feet west of the southeast corner of sec. 24, T. 17 S., R. 26 E.; Woodlake Quadrangle:

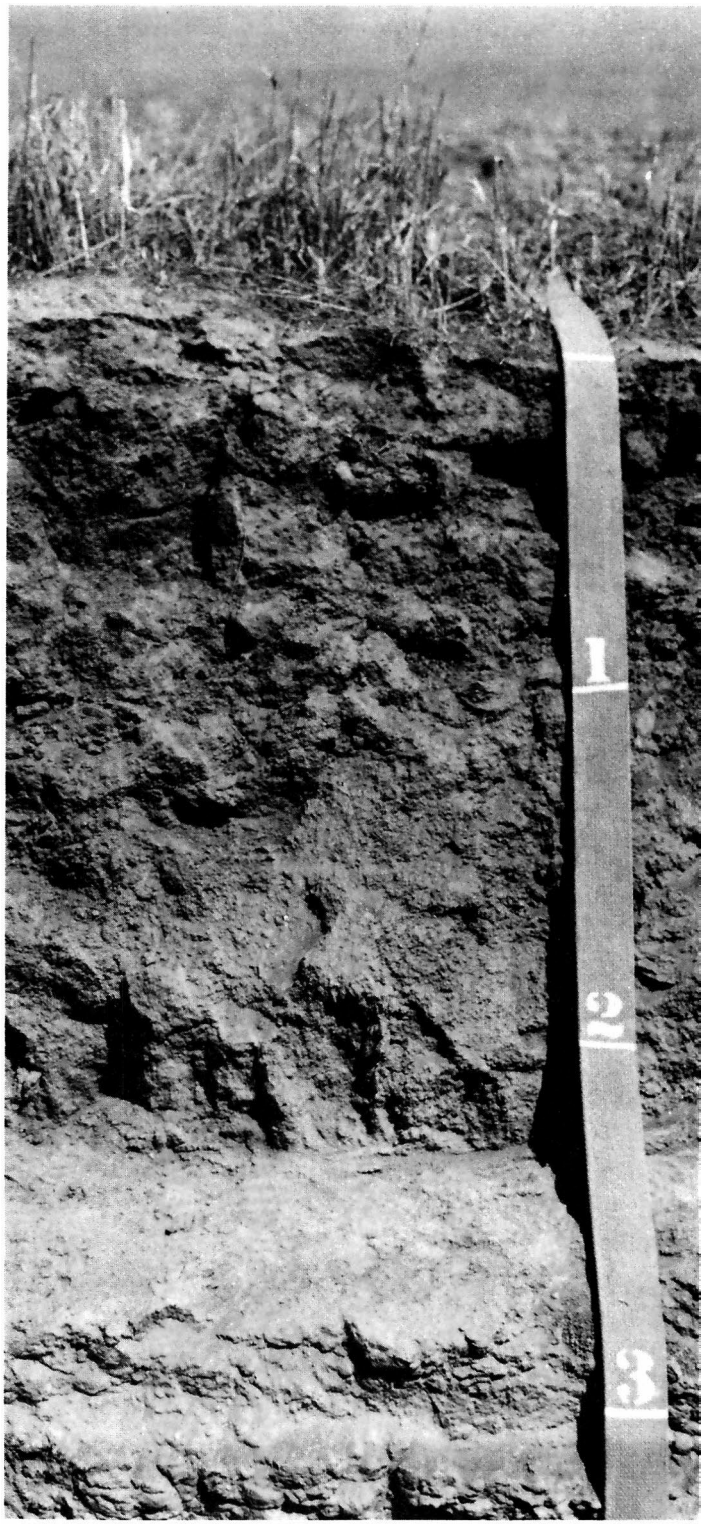


Figure 9.—A profile of San Joaquin loam

Ap—0 to 6 inches; brown (7.5YR 4/4) loam, dark brown (7.5YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine, few fine

and few medium roots, many very fine tubular pores; 2 percent gravel; mildly alkaline (pH 7.8); clear smooth boundary.

A3—6 to 13 inches; reddish brown (5YR 4/4) loam, dark reddish brown (5YR 3/3) moist; weak coarse angular blocky structure, hard, firm, slightly sticky and slightly plastic; many very fine and few fine and medium roots; many very fine tubular pores; mildly alkaline (pH 7.8); gradual smooth boundary.

B1—13 to 20 inches; reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and slightly plastic; many very fine roots; many very fine tubular pores; few thin clay films on faces of peds; mildly alkaline (pH 7.5); abrupt wavy boundary.

B2t—20 to 25 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; strong medium angular blocky structure; very hard, very firm, very sticky and very plastic; common very fine roots; many very fine tubular pores; continuous moderately thick clay films on faces of peds; moderately alkaline (pH 8.0), abrupt wavy boundary.

C1sim—25 to 56 inches; yellowish red (5YR 5/6) silica cemented duripan, dark reddish brown (5YR 3/4) moist; extremely hard; does not soften or crumble after prolonged soaking in water and can be chipped by hand tools with extreme difficulty; many very fine tubular pores; mildly alkaline (pH 7.5); abrupt wavy boundary.

C2—56 to 78 inches; brown (7.5YR 4/4 dry and moist) loam and thin strata of sandy loam; massive; hard, friable, slightly sticky and slightly plastic; mildly alkaline (pH 7.8).

This soil is 20 to 40 inches deep to a duripan. It is 0 to 10 percent gravel throughout. In hummocky areas the soil is shallower to a hardpan between mounds and deeper to the hardpan from the top of mounds.

The A horizon is light brown, brown, or reddish brown (7.5YR 6/4, 5/4, or 4/4; 5YR 4/4). It is neutral or mildly alkaline. The B2t horizon is reddish brown or yellowish red (2.5YR 5/4 or 4/4; 5YR 5/3, 5/4, 4/3, 4/4, or 4/6) clay loam or clay It is neutral to moderately alkaline. The duripan is reddish brown or yellowish red (5YR 4/4, 5/4, or 5/6). In some hummocky areas holes are in the duripan, usually at the center of mounds. The duripan ranges from 6 inches to about 35 inches in thickness. Below the duripan is stratified sandy loam or loam.

San Joaquin soils in this survey area are more alkaline than is defined as the range for the series. This difference does not significantly affect their use and management.

Sesame series

The Sesame series consists of moderately deep, well drained soils that formed in material weathered from granitic rock. Sesame soils are on uplands. Slope ranges from 9 to 50 percent Mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F.

Sesame soils are similar to the Auberry, Blasingame, Coarsegold, and Fallbrook soils They are near the Blasingame, Cieneba, Las Posas, Trabuco, and Vista soils. Auberry and Fallbrook soils have paralithic contact at a depth of 40 to 60 inches Blasingame and Coarsegold soils are more red than 10YR in the argillic horizon. Cieneba soils have paralithic contact at a depth of less than 20 inches Las Posas and Trabuco soils have a fine-textured argillic horizon. Vista soils have a coarse-loamy control section and do not have an argillic horizon.

A typical pedon of Sesame sandy loam, 15 to 30 percent slopes, is about 8 miles east of Ducor, 2,200 feet west and 300 feet north of the southeast corner of sec. 25, T. 23 S., R. 28 E.; Fountain Springs Quadrangle:

A1—0 to 9 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and common fine tubular pores; slightly acid (pH 6.5); gradual smooth boundary.

B21t—9 to 16 inches; brown (10YR 4/3) light sandy clay loam, dark yellowish brown (10YR 3/4) moist; weak medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; many very fine tubular pores; many moderately thick clay films on faces of peds and lining pores; 5 percent gravel; slightly acid (pH 6.4); gradual smooth boundary.

B22t—16 to 31 inches; brown (10YR 4/3) light sandy clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; common very fine tubular pores; many moderately thick clay films on faces of peds and lining pores, 5 percent gravel; neutral (pH 6.7); abrupt irregular boundary.

Cr—31 inches; strongly weathered granitic rock.

This soil has paralithic contact at a depth of 20 to 40 inches. It is from 1 to 10 percent gravel. It is slightly acid or neutral.

The A horizon is dark grayish brown, brown, or grayish brown (10YR 4/2, 4/3, or 5/2). The Bt horizon is brown (10YR 4/3 or 5/3). The Cr horizon is moderately or strongly weathered quartz diorite or granodiorite.

Seville series

The Seville series consists of well drained soils that are moderately deep to a duripan. Seville soils formed in alluvium, derived mainly from basic igneous rock. They are on alluvial fans. Slope ranges from 0 to 2 percent. Mean annual precipitation is 10 inches, and the mean annual air temperature is about 63 degrees F.

Seville soils are similar to the Centerville, Cibo, and Portervılle soils. They are near the Exeter, Porterville, and San Joaquin soils. Centerville, Cibo, and Porterville soıls do not have a durıpan. Exeter soıls have a fine-loamy argıllic horizon. San Joaquin soils have a fine-textured argıllıc horızon.

A typical pedon of Seville clay is located about 1/2 mile south of Seville, 1,900 feet north and 100 feet east of the southwest corner of sec 1, T. 17 S., R. 25 E.; Ivanhoe Quadrangle:

Ap—0 to 9 ınches; brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moıst; strong medıum and coarse angular blocky structure; extremely hard, very fırm, very stıcky and very plastic; many very fıne roots; many very fine tubular pores; mildly alkalıne (pH 7.8); clear smooth boundary.

C1—9 to 25 ınches; dark reddısh gray (5YR 4/2) clay, dark reddısh brown (5YR 3/2) moıst; moderate medium and fine angular blocky stucture; extremely hard, very firm, very sticky and very plastıc; common very fine roots; common very fine tubular pores; many slickensıdes; slightly effervescent; moderately alkalıne (pH 8.0); clear smooth boundary.

C2ca—25 to 38 ınches; reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; massive; extremely hard, very fırm, very sticky and very plastic; few very fine roots; few very fıne tubular pores; many slickensides; violently effervescent, lime ın matrix and soft masses; moderately alkaline (pH 8.4); abrupt wavy boundary.

IIC3si—38 to 52 ınches; light reddısh brown (5YR 6/3) duripan; top 12 inches of duripan ıs strongly cemented and becomes less cemented with depth; lime in seams and fractures; abrupt wavy boundary.

IIC4—52 to 62 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moıst; massive; hard, friable, sticky and slightly plastic; slightly cemented ın parts; slightly effervescent in matrix and violently effervescent in common fine and medium soft masses; moderately alkaline (pH 8.0).

Thıs soil is 20 to 40 ınches deep to a duripan. It ıs from 0 to 5 percent gravel. It is neutral through moderately alkaline.

The A horizon is brown, dark reddish gray, or reddish brown (7.5YR 4/2; 5YR 4/2, 4/3, or 4/4). In some pedons it is slıghtly effervescent to strongly effervescent.

The C horizon is dark reddısh gray, reddish brown, or dark reddish brown (5YR 4/2, 4/3, or 4/4; 2.5YR 3/4). It is strongly effervescent or vıolently effervescent. The duripan is lıght reddish brown, reddish brown, pınkish gray, or light brownish gray (5YR 4/3, 6/3, or 6/4; 7.5YR 7/2; 10YR 6/2). Lıme is ın seams, ın fractures, or on top of the duripan. The durıpan ranges from 4 to 30 inches in thickness. Below the durıpan ıs sand, sandy loam, or sandy clay loam.

Sheephead series

The Sheephead serıes consists of shallow, somewhat excessıvely drained soıls that formed in material weathered from granodıorite. Sheephead soils are on uplands. Slope ranges from 15 to 75 percent. Mean annual precipitation is about 35 ınches, and the mean annual aır temperature is about 55 degrees F.

Sheephead soils are similar to the Crouch, Friant, and Walong soıls. They are near the Crouch and Holland soils. Crouch soils have paralıthic contact at a depth of 40 to 80 inches. Friant soıls have lithic contact at a depth of 10 to 20 ınches and a soıl temperature of more than 59 degrees F. Walong soıls have paralithic contact at a depth of 20 to 40 ınches and a soil temperature of more than 59 degrees F. Holland soils have an argillic horizon.

A typical pedon of Sheephead coarse sandy loam is in an area of Sheephead-Rock outcrop complex, 15 to 75 percent slopes, and ıs located about 10 1/2 miles north of Springville, 2,550 feet west and 2,600 feet south of the northeast corner of sec. 9, T. 19 S., R. 29 E.; Kaweah S.E. Quadrangle·

A1—0 to 11 inches; dark grayish brown (10YR 4/2) coarse sandy loam, very dark gray (10YR 3/1) moıst; moderate fine granular structure; soft, very friable, nonsticky and nonplastıc; few fine and medium roots; slightly acid (pH 6.1); clear smooth boundary.

C1—11 to 18 inches; pale brown (10YR 6/3) coarse sandy loam, brown (10YR 4/3) moıst; weak fıne granular structure; soft, very friable, nonsticky and nonplastic; many medium and common coarse roots; 10 percent gravel; slightly acid, (pH 6.1); abrupt irregular boundary.

C2r—18 inches; very pale brown (10YR 7/3) strongly weathered granodiorite.

Thıs soil has paralithic contact at a depth of 10 to 20 ınches. It is from 0 to 15 percent gravel and from 0 to 10 percent cobbles.

The A horizon is dark grayısh brown or brown (10YR 4/2, 4/3, or 5/3). The Cr horizon is strongly weathered quartz diorite or granodiorıte. In some places a few, unweathered boulders are ın this horizon.

Trabuco series

The Trabuco serıes consists of deep, well drained soıls that formed in material weathered from gabbro. Trabuco soils are on uplands. Slope ranges from 15 to 50 percent. Mean annual precipitation ıs about 22 ınches, and the mean annual air temperature is about 61 degrees F.

Trabuco soıls are similar to the Las Posas soıls. They are near the Cibo, Las Posas, and Sesame soıls. Las Posas soils have hue of 2.5YR throughout the argillic horizon and less organic matter in the A horizon. Cibo

soils are vertisols and have lithic contact at a depth of 20 to 40 inches. Sesame soils have a fine-loamy argillic horizon and paralithic contact at a depth of 20 to 40 inches.

A typical pedon of Trabuco loam, 30 to 50 percent slopes, is located about 6 miles northwest of Three Rivers, 2,400 feet west and 850 feet south of the northeast corner of projected sec. 29, T. 16 S., R. 28 E.; Giant Forest S.W. Quadrangle:

A1—0 to 8 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine, common fine, and few medium tubular pores; neutral (pH 6.8); abrupt wavy boundary.

B1t—8 to 12 inches; reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; weak medium angular blocky structure; very hard, firm, sticky and plastic; common very fine and few fine roots; common very fine tubular pores; many moderately thick clay films on faces of peds; neutral (pH 6.8); clear wavy boundary.

B2t—12 to 26 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; moderate medium angular blocky structure; very hard, very firm, sticky and very plastic; common very fine roots; few very fine tubular pores; continuous moderately thick clay films on faces of peds; 3 percent gravel; neutral (pH 7.0); clear wavy boundary.

B3—26 to 42 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 3/2) moist; massive; very hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; 15 percent gravel; neutral (pH 7.0); clear wavy boundary.

Cr—42 inches; strongly weathered gabbro.

This soil has paralithic contact at a depth of 40 to 60 inches. It is from 0 to 15 percent gravel. It is slightly acid or neutral.

The A horizon is brown, dark grayish brown, reddish brown, or dark reddish gray (10YR 5/3 or 4/2; 7.5YR 5/4 or 4/2; 5YR 4/4 or 4/2). The B2t horizon is reddish gray, reddish brown, dark reddish brown, dark red, or red (5YR 4/4, 5/2, 3/3, or 3/4; 2.5YR 3/6, 4/4, or 4/6).

Tujunga series

The Tujunga series consists of very deep, somewhat excessively drained soils that formed in alluvium, derived mainly from granitic sources. Tujunga soils are on alluvial fans. Slope ranges from 0 to 5 percent. Mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F.

Tujunga soils are similar to the Honcut soils. They are near the Grangeville, Honcut, San Emigdio, and Yettem soils. Honcut and San Emigdio soils have a coarse-loamy control section. Grangeville soils are somewhat poorly drained and have a mollic epipedon. Yettem soils have a coarse-loamy control section and a mollic epipedon.

A typical pedon of Tujunga sand is located about 1 mile south of Woodlake, 2,350 feet east and 600 feet north of the southwest corner of sec. 31, T. 17 S., R. 27 E.; Woodlake Quadrangle:

C1—0 to 8 inches; light brownish gray (10YR 6/2) sand, dark grayish brown (10YR 4/2) moist; single grain; loose; nonsticky and nonplastic; common very fine roots; very porous; neutral (pH 6.8); diffuse boundary.

C2—8 to 16 inches; grayish brown (10YR 5/2) sand, dark grayish brown (10YR 4/2) moist; single grain; loose; nonsticky and nonplastic; common very fine roots; very porous; neutral (pH 6.8); diffuse boundary.

C3—16 to 60 inches; stratified grayish brown (10YR 5/2) sand and very pale brown (10YR 8/3) coarse sand; single grain; loose; nonsticky and nonplastic; very porous; 2 percent gravel; neutral (pH 6.8).

The C horizon is grayish brown, light brownish gray, or very pale brown (10YR 5/2, 6/2, or 8/3). It is sand or loamy sand. It is from 2 to 5 percent gravel.

Vista series

The Vista series consists of moderately deep, well drained soils that formed in material weathered from quartz diorite. Vista soils are on uplands. Slope ranges from 9 to 50 percent. Mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F.

Vista soils are similar to the Cieneba soils. They are near the Auberry, Blasingame, Cieneba, Fallbrook, Friant, Sesame, and Walong soils. Cieneba soils do not have a cambic horizon, but they have paralithic contact at a depth of less than 20 inches. Auberry, Blasingame, Fallbrook, and Sesame soils have an argillic horizon. Friant soils have a mollic epipedon and lithic contact at a depth of 10 to 20 inches. Walong soils have a mollic epipedon.

A typical pedon of Vista coarse sandy loam, 15 to 30 percent slopes, is located about 1/4 mile east of Springville, 1,280 feet west and 1,900 feet south of the northeast corner of sec. 2, R. 21 S., R. 29 E.; Springville Quadrangle:

A11—0 to 3 inches; pale brown (10YR 6/3) coarse sandy loam, dark brown (10YR 3/3) moist; moderate very fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many very fine and few fine interstitial pores; neutral (pH 7.0); clear wavy boundary

A12—3 to 10 inches; pale brown (10YR 6/3) coarse sandy loam, dark yellowish brown (10YR 3/4) moist;

weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many very fine and few fine interstitial pores; neutral (pH 7.0); clear wavy boundary.

B21—10 to 21 inches; pale brown (10YR 6/3) coarse sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine and few fine roots; few medium and very fine tubular pores and few very fine interstitial pores; few thin clay films lining pores and bridging sand grains; slightly acid (pH 6.1), gradual irregular boundary.

B22—21 to 27 inches; light yellowish brown (10YR 6/4) coarse sandy loam, brown (7.5YR 4/2) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; common fine tubular pores and common fine and very fine interstitial pores; few thin clay films lining pores and bridging sand grains; slightly acid (pH 6.1); abrupt wavy boundary.

Cr—27 inches; variable colored moderately weathered quartz diorite.

This soil has paralithic contact with weathered quartz diorite at a depth of 20 to 40 inches. Clay increases from 1 percent in the A horizon to 2 percent in the B horizon.

The A horizon is brown, grayish brown, or pale brown (10YR 4/3, 5/2, 5/3, or 6/3). It is slightly acid or neutral. The B2 horizon is brown, grayish brown, yellowish brown, pale brown, or light yellowish brown (10YR 4/3, 5/2, 5/3, 5/4, 6/3, or 6/4; 7.5YR 5/4). It is sandy loam or coarse sandy loam that is slightly acid or neutral. The Cr horizon is moderately weathered or strongly weathered quartz diorite.

Walong series

The Walong series consists of moderately deep, well drained soils that formed in material weathered from granitic rock. Walong soils are on uplands. Slope ranges from 15 to 50 percent. Mean annual precipitation is about 18 inches, and the mean annual air temperature is about 61 degrees F.

Walong soils are similar to the Crouch and Sheephead soils They are near the Auberry, Blasingame, Cieneba, and Vista soils. Crouch soils have paralithic contact at a depth of 40 to 80 inches. Sheephead soils have paralithic contact at a depth of less than 20 inches. Auberry soils have paralithic contact at a depth of 40 to 60 inches and have an argillic horizon. Blasingame soils have an ochric epipedon and an argillic horizon. Cieneba soils have an ochric epipedon and are less than 20 inches to paralithic contact. Vista soils have an ochric epipedon.

A typical pedon of Walong sandy loam is in an area of Walong-Rock outcrop complex, 15 to 50 percent slopes, and is located about 4 1/2 miles east of Three Rivers, 900 feet west and 880 feet south of the northeast corner of sec 39, T 17 S., R. 29 E., Kaweah N.E. Quadrangle:

O1—1 inch to 0; moss, leaves, and organic litter of annual grasses

A11—0 to 11 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and common fine roots; many very fine tubular pores; neutral (pH 6.7); clear wavy boundary

A12—11 to 13 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and common fine roots; many very fine and common fine tubular pores; 5 percent gravel; neutral (pH 6.6); clear wavy boundary.

B2—13 to 21 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; common very fine, common fine, and few coarse roots; common fine and common fine tubular pores; few thin clay films lining pores; 5 percent gravel; neutral (pH 6.6); clear wavy boundary.

B3—21 to 33 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few coarse roots; common very fine and common fine tubular pores; 10 percent gravel; neutral (pH 6.6); clear irregular boundary.

Cr—33 inches; light yellowish brown (10YR 6/4) strongly weathered granitic rock.

This soil has paralithic contact with weathered granite at a depth of 20 to 40 inches. It is from 0 to 15 percent gravel.

The A horizon is dark grayish brown, grayish brown, or brown (10YR 4/2, 4/3, 5/2, or 5/3). The B horizon is brown, yellowish brown, pale brown, or light yellowish brown (10YR 4/3, 5/3, 5/4, 6/3, or 6/4; 7.5YR 5/4).

Wyman series

The Wyman series consists of very deep, well drained soils that formed in alluvium, derived mainly from basic igneous rocks. Wyman soils are on alluvial fans. Slope ranges from 0 to 5 percent. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F.

Wyman soils are similar to the Greenfield soils. They are near the Centerville, Exeter, San Joaquin, and Porterville soils. Greenfield soils have a coarse-loamy control section. Centerville and Porterville soils are vertisols. Exeter and San Joaquin soils have a duripan that is below a depth of 20 inches and ranges to a depth of 40 inches.

A typical pedon of Wyman loam, 0 to 2 percent slopes, is located about 1 mile east of Lindsay, 1,250 feet west and 1,300 feet south of the northeast corner of sec. 8, T. 20 S., R. 27 E.; Lindsay Quadrangle:

Ap—0 to 7 inches; brown (10YR 4/3) loam, dark yellowish brown (10YR 3/4) moist; massive, hard, friable, slightly sticky and slightly plastic; many very fine roots, many very fine tubular pores; neutral (pH 7.0), gradual smooth boundary

A3—7 to 19 inches; brown (10YR 4/3) loam, dark yellowish brown (10YR 3/4) moist; massive; hard, friable, slightly sticky and slightly plastic; many very fine and common fine roots; many very fine tubular pores; neutral (pH 7.3); clear smooth boundary.

B21—19 to 30 inches; brown (7.5YR 4/4) heavy loam, dark reddish brown (5YR 3/4) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine, common fine, and common coarse roots; many very fine tubular pores; few thin clay films lining pores and bridging sand grains; mildly alkaline (pH 7.5); gradual smooth boundary.

B22t—30 to 54 inches; brown (7.5YR 4/4) clay loam, dark reddish brown (5YR 3/3) moist; weak coarse angular blocky structure; hard, friable, sticky and plastic; many very fine and common fine roots; many very fine and common fine tubular pores; many thin clay films on faces of peds and common moderately thick clay films lining pores; 2 percent gravel; mildly alkaline (pH 7 5); clear smooth boundary.

B3—54 to 69 inches; brown (7.5YR 4/4) sandy clay loam, reddish brown (5YR 4/4) moist; massive; hard, friable, slightly sticky and plastic; many very fine tubular pores; 3 percent gravel; mildly alkaline (pH 7 8); abrupt smooth boundary.

C1—69 to 75 inches; yellowish brown (10YR 5/4) sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; mildly alkaline (pH 7.5).

The solum of this soil ranges from 28 inches to more than 60 inches in thickness. It ranges from 0 to 30 percent gravel throughout. The soil is slightly acid to mildly alkaline.

The A horizon is brown (10YR 4/3 or 5/3; 7.5YR 4/4 or 5/4) loam or gravelly loam. The Bt horizon is brown, reddish brown, dark reddish brown, or yellowish red (7.5YR 4/4 or 5/4; 5YR 4/4, 5/4, 3/3, or 5/6). It is heavy loam, clay loam, sandy clay loam, or gravelly sandy clay loam. The C horizon is yellowish brown or reddish brown (10YR 5/4; 5YR 4/4) sand or very gravelly sand.

Yettem series

The Yettem series consists of very deep, well drained soils that formed in alluvium, mainly from granitic sources. Yettem soils are on alluvial fans Slope ranges from 0 to 5 percent. The mean annual precipitation is about 10 inches, and the mean annual air temperature is about 63 degrees F.

Yettem soils are similar to the Grangeville and Havala soils. They are near the Grangeville, Havala, Honcut, and Tujunga soils Grangeville soils are somewhat poorly drained and decrease irregularly in organic matter as depth increases. Havala soils have an argillic horizon. Honcut soils have an ochric epipedon. Tujunga soils have a sandy control section.

A typical pedon of Yettem sandy loam, 0 to 2 percent slopes, is located about 6 miles north of Orosi, 2,600 feet west and 200 feet south of the northeast corner of sec. 8, T. 15 S., R 25 E.; Orange Cove North Quadrangle:

Ap—0 to 14 inches, dark gray (10YR 4/1) sandy loam, very dark gray (10YR 3/1) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and few fine tubular pores; slightly acid (pH 6.3); clear smooth boundary.

A12—14 to 26 inches; gray (10YR 5/1) sandy loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and few fine tubular pores; slightly acid (pH 6.5); clear smooth boundary.

C1—26 to 56 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; common very fine tubular pores; neutral (pH 7.0); clear smooth boundary.

C2—56 to 70 inches; light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; many very fine tubular pores; slight effervescence from disseminated lime; mildly alkaline (pH 7.8).

This soil is more than 60 inches deep. It is medium acid to mildly alkaline in the upper part and neutral to moderately alkaline in the lower part.

The A horizon is dark gray, dark grayish brown, brown, gray or grayish brown (10YR 4/1, 4/2, 4/3, 5/1, or 5/2). The C horizon is brown, grayish brown, yellowish brown, light brownish gray, light gray, or very pale brown (10YR 4/3, 5/2, 5/3, 5/4, 6/2, 7/2, or 7/3). It is coarse sandy loam, sandy loam, or fine sandy loam. In some pedons the lower part of the C horizon is noncalcareous.

formation of the soils

This section discusses the factors of soil formation, relates them to the formation of soils in the survey area, and explains the processes of soil formation.

Soil is a mixture of rocks and minerals, organic matter, and water and air, in varying proportions. The factors that cause soils to differ are (1) the physical and chemical composition of the parent material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the biological forces; (4) the relief or lay of the land; and (5) the length of time the forces of development have acted on the soil material. The relative importance of each factor differs from place to place, but generally the interaction of all the factors determines the kind of soil that forms in any given place.

parent material

The parent material from which the soils in the central part of Tulare County have formed is both residual and transported. The parent material is the weathered rock or inconsolidated material from which soils form. The hardness, grain size, and porosity of the parent material and its content of weatherable minerals greatly influence the formation of soils. Three main sources of parent material are in the central part of Tulare County: (1) hard bedrock, (2) alluvium, and (3) weakly consolidated, old alluvial sediments.

Parent material of most soils in the survey area weathered from hard bedrock in the Sierra Nevada foothills. The rock is classified as igneous or metamorphic. In the igneous class the intrusive or coarse grained rocks include such materials as granite and gabbro. In the metamorphic class is the foliated mica schist.

The granites are mainly composed of quartz and orthoclase (potassium) feldspar, lesser amounts of mica, and small amounts of hornblende. Soils formed from these rocks by geochemical weathering tend to be coarse textured, especially in surface horizons *(4).* The Auberry, Blasingame, Cieneba, Crouch, Fallbrook, Holland, Sesame, Vista, and Walong soils formed in material weathered from granitic rock.

Gabbro rock is somewhat more weatherable than granitic rock under similar climatic conditions. Gabbro is mainly composed of plagioclase (sodium and calcium), feldspar, augite, and hornblende. Material weathered from gabbro is mostly fine textured. From it formed the Cibo, Las Posas, and Trabuco soils.

Mica schist is foliated metamorphic rock that is rich in mica, has varying amounts of quartz, and has very small amounts of other weatherable minerals. Because of low quartz content, soils that formed in weathered mica schists tend to be silty and less coarse than those that formed from granitic rock. The Coarsegold and Friant soils formed in material weathered from mica schist.

Recent alluvium. This material consists of relatively unweathered, predominately granitic sediments deposited during recent geological time on fans and flood plains The deposits on flood plains and fans of the rivers and streams generally are moderately coarse or coarse textured. The Grangeville, Honcut, San Emigdio, Tujunga, and Yettem soils formed from this material.

Young alluvium. This material was deposited earlier than the recent alluvium. The Greenfield soils have been included in this group. These soils have more clay in the B horizon.

Old alluvium from granitic sources. This material was deposited on large, low river terraces. In some soils, the layers have been altered to a depth of several feet and are compacted or cemented. The San Joaquin and Exeter soils formed from this material. These two soils have distinct subsoil development and a strongly cemented hardpan that is mainly silica and iron.

The Clear Lake soils have formed where fine textured material has accumulated in basins and swales of drainageways.

Old alluvium from mixed rock or basic rock sources. These soils are lower in quartz than the granitic alluvium and contain more weatherable, dark colored minerals The material was laid down by small streams flowing from the lower foothills. Gabbro is the principle source from which this material was derived. The Wyman soils formed in areas of these fans. The Porterville soils formed in fine textured alluvium, some of which is stony or cobbly. They are on foot slopes or are along the edges of hills of basic igneous rock, which are along the eastern edge of the valley.

Seville soils are characterized by having a lithologic discontinuity at a depth of 20 to 40 inches. This soil formed by the deposition of clayey alluvial material over older soil material, such as that found in the San Joaquin or Exeter soils.

Very old alluvium. This material consists of older deposits of alluvium on dissected terraces in the

southwestern corner of the survey area. The terraces are remnants of larger and older alluvium deposits long since eroded away. The material contains a large amount of feldspathic sand from which the Centerville clays have formed.

climate

Climate has a major influence on the formation of soils in the central part of Tulare County. Moisture and heat influence the amount and kind of vegetation that grows, the rate at which minerals weather, and the removal of material from the different soil horizons or the accumulation of material in them.

The summers are virtually rainless. The winters are cool, and most of the annual precipitation falls between December and March. By late spring the soils are usually moist to a depth of several feet. By late summer these same soils are severely dry.

As fronts cross the valley into the upper foothills, rainfall increases. The mean annual precipitation ranges from 10 to 12 inches in the San Joaquin Valley. It increases to about 18 inches in the lower foothills and to about 35 inches in the upper foothills.

The air temperatures vary considerably from the San Joaquin Valley to the upper foothills. The mean annual air temperature is about 63 degrees F in the San Joaquin Valley. It decreases to 61 degrees F in the lower foothills and to about 55 degrees F in the upper foothills.

In the valley and lower foothills, plant growth is rapid in the spring but ceases in May and June because of the lack of moisture and increased air temperature. As elevation increases in the foothills, plant growth extends later into the summer because of the increased precipitation and lower temperatures. In the upper foothills vegetation is more abundant and the organic matter level of the soils increases. A dark colored surface soil replaces the light colored, massive surface soil of the valley and lower foothills.

The oxidation of the organic matter during the hot summers and the limited growth period in the valley and in the lower foothills permit little accumulation of organic matter. Most of the soils in the valley and lower foothills have less organic matter than the soils of the upper foothills.

biological activity

The vegetation in the survey area has had more effect on the formation of soils than other biological agents. Burrowing animals, insects, and bacteria and fungi are important influences, but their activity depends in large part upon the vegetation that grows on the soil. The main effects of vegetation result from the accumulation of organic matter in the surface layer and penetration or roots into the surface layer and subsoil.

On the poorly drained flood plains, the lush growth of vegetation provides the organic matter that produces the mollic epipedon of the Grangeville soils. On the terraces, gophers produced the mima-mound microrelief, known locally as hogwallows, characteristic of the San Joaquin (fig. 10) and Exeter soils. These soils have a duripan at a depth of less than 40 inches. The seasonal saturation of the soil above the hardpan has altered the living and nesting habits of the gophers so that mound formation was necessary *(3)*.

The north slopes of the foothills are protected from direct sunlight. This shading increases the amount of water available to plants because evaporation is decreased. Because of this additional soil moisture, soils on these slopes support an increased amount of grasses, forbs, shrubs, and hardwood trees. This vegetation adds organic matter to the soil and influences the color, structure, and physical condition of the soil. Walong soils are examples of this effect. In contrast, the vegetation on the steep south slopes in some areas is sparse. This cover provides little shade and little organic matter, so the soil is dry for longer periods of time. The shallow Cieneba soils are on these exposed slopes.

In the foothills, the plant cover changes as precipitation increases. Annual grasses, forbs, and scattered oak dominate on the lower foothills. These gradually give way on the higher foothills to a mixture of shrubs, oaks, and coniferous trees. Decomposition of the organic matter and metabolism of plants produce acids that increase the rate of weathering. Leaf litter, or duff, also insulates the soil against heat and cold and reduces the rate of evaporation, which increases the length of time favorable for bacterial activity.

time

The effect of time on soil formation in the central part of Tulare County is evident in the degree of development and alteration of parent material by the interacting forces of climate, living organisms, and relief. The position of soils on fans and terraces generally establishes their comparative age. The lowest stream bottom generally consists of the most recent alluvium and the highest terraces consist of the oldest alluvium.

The soils that formed in recent deposits of alluvium generally are deep and permeable. These soils generally do not have horizon development, and some are stratified, showing evidence of recent overflow by flooding. These recent alluvial soils are the Tujunga, Honcut, Grangeville, and Yettem soils.

The alluvial soils considered to be intermediate in age are the Havala, Greenfield, and Wyman soils. These soils are developing diagnostic subsurface horizons. These soils generally form between the recent alluvium on bottom land and the high terraces.

On the high terraces are the oldest soils. Because of their high position in the landscape, the oldest soils are no longer susceptible to flooding and have been in place long enough to have well developed profiles. Such soils as Exeter and San Joaquin are considered old soils.

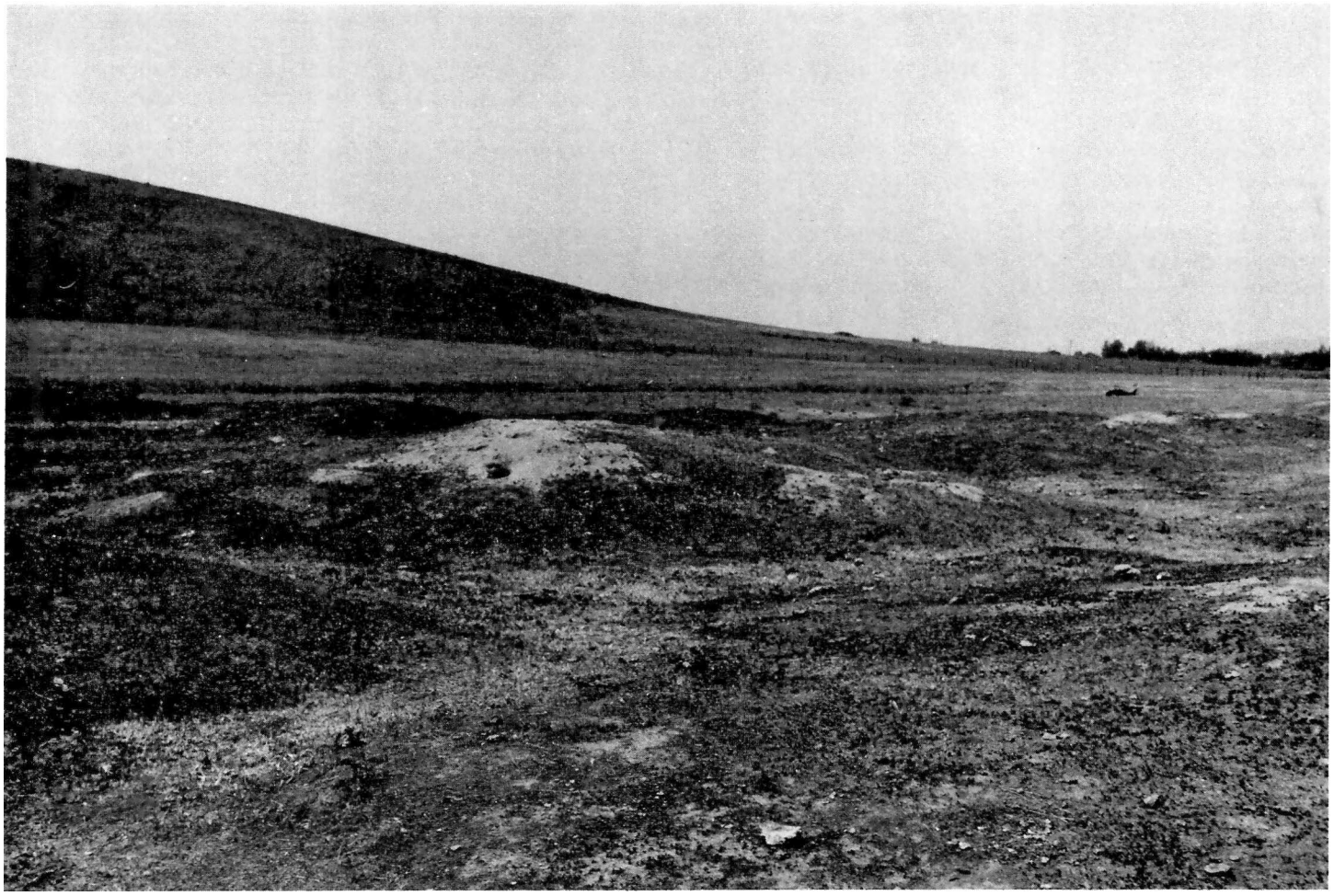


Figure 10—Mima-mound microrelief, known as hogwallows, on San Joaquin soils

They have a clay enriched subsoil and a silica cemented duripan directly below.

In the foothills most of the soil surface has been subject to fairly steady geologic erosion. Presumably most of the soils are younger than those on the high terraces. The effect of changing climate as elevation increases has more influence on the profile development than time alone.

relief

Relief influences soil formation primarily by its effect upon drainage, runoff, and water erosion and secondarily by variations in exposure to the sun and wind and in air drainage. Major differences in relief in the central part of Tulare County can best be shown by describing the three prominent physiographic units: (1) the terraces and alluvial fans in the San Joaquin Valley; (2) the lower foothills of the Sierra Nevada; and (3) the upper foothills of the Sierra Nevada.

Young and recent alluvial fans are along streams that extend into the San Joaquin Valley. They are nearly level to gently sloping and formed from the continual deposition of soil material. Lower and more nearly level areas in this landscape receive additional soil moisture from a high water table. This has produced more abundant vegetation and accounts for the high organic matter content in the Grangeville soils. Honcut, San Emigdio, and Yettum soils are also in fans. Vegetation is less abundant on these positions because of limited soil moisture; therefore, these soils have lower amounts of organic matter and a lighter colored surface layer.

On the terrace, water ponds above the hardpan for short periods in the San Joaquin and Exeter soils. Mounded microrelief was common where the soils have hardpans, but land leveling or cultivating has smoothed most areas.

The moderately deep Seville and very deep Porterville clay soils are found on alluvial fans close to the foot

slopes of the lower foothills made of basic igneous rock. These soils have formed in weathered material that was transported to the bottom of foothills by gravitational forces and localized water movement.

In the foothills slope ranges from undulating to very steep and runoff varies accordingly. Steep and very steep soils generally have rapid runoff. Material is rapidly eroded from the surface, so the effects of plants and animals on the soils are slight. In general, steeper soils have less soil material available for forming a distinctive surface layer and subsoil, are less affected by leaching, and are shallow. The chatacteristics of Cieneba soils have been determined in part by their steep slopes.

Aspect, or the direction a slope faces, becomes increasingly important in the foothills. Direction and slope of the soil affect the soil temperature. Walong soils are generally on north-facing slopes, which are cooler and support more vegetation. More vegetation results in a dark colored surface layer.

On ridgetops, at higher elevations, soils are generally deeper. This is characteristic of the Holland and Crouch soils.

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glossary

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Broad-base terrace. A ridge-type terrace built to control erosion by diverting runoff along the contour at a nonscouring velocity. The terrace is 10 to 20 inches high and 15 to 30 feet wide and has gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is

not practical to map them separately at the selected scale of mapping The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Congeliturbate. Soil material disturbed by frost action.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are comr .only medium textured They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are

commonly level or depressed and are frequently ponded Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Duripan. A subsurface horizon that is cemented by silica

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion hazard. The severity with which water erodes a soil that has no vegetative cover.

Excess alkali (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Feldspathic. Containing feldspar.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:
O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.
Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.
Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.
Low strength. The soil is not strong enough to support loads.
Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.
Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.
Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.
Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.
Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.
Moderately coarse textured soil. Sandy loam and fine sandy loam.
Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.
Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.
Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).
Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.
Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)
Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.
Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.
Organic matter. Plant and animal residue in the soil in various stages of decomposition.
Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.
Parent material. The unconsolidated organic and mineral material in which soil forms.
Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.
Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.
Percolation. The downward movement of water through the soil.
Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.
Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)
Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.
Pitting (in tables). Pits caused by melting ground ice. They form on the soil after plant cover is removed.
Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.
Plastic limit. The moisture content at which a soil changes from semisolid to plastic.
Plowpan. A compacted layer formed in the soil directly below the plowed layer.
Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.
Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.
Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.
Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an

arbitrarily chosen age For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100 Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, range of slope is defined as follows:
0 to 2 percent: simple slopes—nearly level; complex slopes—nearly level.
2 to 5 percent: simple slopes—gently sloping; complex slopes—undulating.
5 to 9 percent: simple slopes—moderately sloping; complex slopes—gently rolling.
9 to 15 percent: simple slopes—strongly sloping; complex slopes—rolling.
15 to 30 percent: simple slopes—moderately steep; complex slopes—hilly.
30 to 50 percent: simple slopes—steep; complex slopes—steep.
More than 50 percent: simple slopes—very steep; complex slopes—very steep.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium absorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to $CA^{++} + Mg^{++}$. The degrees of sodicity are—

	SAR
Slight	Less than 13 1
Moderate	13-30 1
Strong	More than 30 1

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2 0 to 1 0
Coarse sand	1 0 to 0 5
Medium sand	0 5 to 0.25
Fine sand	0 25 to 0 10
Very fine sand	0 10 to 0.05
Silt	0 05 to 0 002
Clay	less than 0 002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below the A horizon.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year Summer fallow is frequently practiced before planting winter grain.

Surface layer. Technically the A horizion excluding the A2 horizon. Usually that part of the profile that is highest in organic matter and darker in color.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils

are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-76 at Ash Mountain, California]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	57.1	35.8	46.5	75	24	33	4.73	1.82	7.11	6	0.5
February	60.9	38.8	49.9	78	28	76	3.77	.92	6.02	6	.3
March	63.7	41.0	52.4	81	29	141	3.61	.78	5.84	6	.5
April	69.4	45.3	57.4	89	31	269	3.01	1.12	4.51	5	.4
May	79.0	52.0	65.5	99	36	481	.87	.09	1.45	2	.0
June	89.0	60.3	74.7	108	44	741	.28	---	.49	1	.0
July	97.7	68.1	82.9	108	53	1,020	.07	---	.11	0	.0
August	96.2	66.7	81.5	106	51	977	.11	---	.10	0	.0
September	91.0	61.1	76.0	106	45	780	.43	---	.77	1	.0
October	79.8	52.0	66.0	99	38	496	.88	---	1.55	2	.0
November	66.7	42.8	54.8	87	30	174	2.83	.84	4.41	5	.4
December	57.9	36.4	47.2	76	24	73	4.36	.71	7.12	6	.2
Yearly:											
Average	75.7	50.0	62.9	---	---	---	---	---	---	---	---
Extreme	---	---	---	110	23	---	---	---	---	---	---
Total	---	---	---	---	---	5,261	24.95	17.32	31.93	40	2.3

[1] A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-76 at Ash Mountain, California]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	January 22	February 25	April 26
2 years in 10 later than--	January 7	February 13	April 14
5 years in 10 later than--	(1)	January 20	March 20
First freezing temperature in fall:			
1 year in 10 earlier than--	December 19	November 23	November 13
2 years in 10 earlier than--	December 28	December 4	November 19
5 years in 10 earlier than--	(1)	December 26	November 30

[1] The probability that the temperature will reach 24° or lower is less than 5 years in 10.

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-76 at Ash Mountain, California]

Probability	Daily minimum temperature		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	355	295	211
8 years in 10	365	310	226
5 years in 10	365	348	255
2 years in 10	365	365	283
1 year in 10	365	365	298

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
100	Auberry sandy loam, 5 to 9 percent slopes	780	0.1
101	Auberry sandy loam, 9 to 15 percent slopes	4,296	0.5
102	Auberry sandy loam, 15 to 30 percent slopes	12,158	1.5
103	Auberry sandy loam, 30 to 50 percent slopes	13,682	1.7
104	Auberry-Rock outcrop complex, 9 to 50 percent slopes	65,920	8.0
105	Blasingame sandy loam, 9 to 15 percent slopes	4,608	0.6
106	Blasingame sandy loam, 15 to 30 percent slopes	23,382	2.9
107	Blasingame sandy loam, 30 to 50 percent slopes	17,666	2.2
108	Blasingame-Rock outcrop complex, 9 to 50 percent slopes	78,382	9.5
109	Centerville clay, 0 to 2 percent slopes	1,242	0.2
110	Centerville clay, 2 to 9 percent slopes	33,694	4.1
111	Centerville clay, 9 to 15 percent slopes	10,694	1.3
112	Centerville clay, 15 to 30 percent slopes	9,224	1.1
113	Cibo clay, 15 to 30 percent slopes	9,970	1.2
114	Cibo clay, 30 to 50 percent slopes	7,758	1.0
115	Cibo-Rock outcrop complex, 15 to 50 percent slopes	34,054	4.2
116	Cieneba-Rock outcrop complex, 15 to 75 percent slopes	64,160	7.8
117	Clear Lake clay, drained	1,654	0.2
118	Coarsegold loam, 15 to 30 percent slope	3,550	0.4
119	Coarsegold loam, 30 to 50 percent slopes	21,386	2.6
120	Coarsegold-Rock outcrop complex, 15 to 50 percent slopes	11,806	1.4
121	Crouch coarse sandy loam, 15 to 30 percent slopes	402	*
122	Crouch coarse sandy loam, 30 to 50 percent slopes	848	0.1
123	Crouch-Rock outcrop complex, 15 to 50 percent slopes	15,068	1.8
124	Exeter loam, 0 to 2 percent slopes	16,868	2.1
125	Exeter loam, 2 to 9 percent slopes	8,214	1.0
126	Fallbrook sandy loam, 9 to 15 percent slopes	740	0.1
127	Fallbrook sandy loam, 15 to 30 percent slopes	1,200	0.1
128	Fallbrook sandy loam, 30 to 50 percent slopes	1,228	0.2
129	Fallbrook-Rock outcrop complex, 9 to 50 percent slopes	5,770	0.7
130	Friant-Rock outcrop complex, 15 to 75 percent slopes	37,742	4.6
131	Grangeville silt loam, drained	5,306	0.7
132	Greenfield sandy loam, 0 to 2 percent slopes	1,690	0.2
133	Greenfield sandy loam, 2 to 5 percent slopes	2,768	0.3
134	Havala loam, 0 to 2 percent slopes	1,476	0.2
135	Havala loam, 2 to 5 percent slopes	3,764	0.5
136	Holland loam, 15 to 30 percent slopes	2,170	0.3
137	Holland loam, 30 to 50 percent slopes	9,608	1.2
138	Holland-Rock outcrop complex, 15 to 50 percent slopes	17,736	2.2
139	Honcut sandy loam, 0 to 2 percent slopes	2,952	0.4
140	Honcut sandy loam, 2 to 5 percent slopes	3,318	0.4
141	Las Posas loam, 9 to 15 percent slopes	892	0.1
142	Las Posas loam, 15 to 30 percent slopes	2,558	0.3
143	Las Posas loam, 30 to 50 percent slopes	4,912	0.6
144	Las Posas-Rock outcrop complex, 9 to 50 percent slopes	5,660	0.7
145	Lewis clay loam	1,486	0.2
146	Pits	668	0.1
147	Porterville clay, 0 to 2 percent slopes	11,536	1.4
148	Porterville clay, 2 to 9 percent slopes	18,232	2.2
149	Porterville clay, 9 to 15 percent slopes	3,140	0.4
150	Porterville cobbly clay, 2 to 15 percent slopes	6,860	0.8
151	Riverwash	2,618	0.3
152	Rock outcrop	11,918	1.5
153	San Emigdio loam	7,194	0.9
154	San Joaquin loam, 0 to 2 percent slopes	33,272	4.1
155	San Joaquin loam, 2 to 9 percent slopes	17,862	2.2
156	Sesame sandy loam, 9 to 15 percent slopes	316	*
157	Sesame sandy loam, 15 to 30 percent slopes	8,040	1.0
158	Sesame sandy loam, 30 to 50 percent slopes	422	0.1
159	Seville clay	2,262	0.3
160	Sheephead-Rock outcrop complex, 15 to 75 percent slopes	13,638	1.7
161	Trabuco loam, 15 to 30 percent slopes	622	0.1
162	Trabuco loam, 30 to 50 percent slopes	2,692	0.3
163	Trabuco-Rock outcrop complex, 15 to 50 percent slopes	1,134	0.1
164	Tujunga sand	7,072	0.9
165	Vista coarse sandy loam, 9 to 15 percent slopes	1,738	0.2
166	Vista coarse sandy loam, 15 to 30 percent slopes	5,576	0.7
167	Vista coarse sandy loam, 30 to 50 percent slopes	2,556	0.3

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
168	Vista-Rock outcrop complex, 9 to 50 percent slopes	39,208	4.8
169	Walong sandy loam, 15 to 30 percent slopes	522	0.1
170	Walong sandy loam, 30 to 50 percent slopes	1,304	0.2
171	Walong-Rock outcrop complex, 15 to 50 percent slopes	8,904	1.1
172	Wyman loam, 0 to 2 percent slopes	1,868	0.2
173	Wyman loam, 2 to 5 percent slopes	3,024	0.4
174	Wyman gravelly loam, 0 to 2 percent slopes	554	0.1
175	Xerofluvents, flooded	4,374	0.5
176	Yettem sandy loam, 0 to 2 percent slopes	4,756	0.6
177	Yettem sandy loam, 2 to 5 percent slopes	2,314	0.3
	Water	4,722	0.6
	Total	815,360	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF IRRIGATED CROPS

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Oranges	Olives[2]	Plums[3]	Almonds	Table grapes	Cotton lint	Walnuts
	Box[1]	Ton	Ton	Lb[4]	Ton	Lb	Ton[5]
109---------- Centerville	500	3	---	1,500	---	600	---
110, 111---------- Centerville	500	3	---	1,500	---	---	---
112---------- Centerville	---	---	---	1,500	---	---	---
117---------- Clear Lake	150	2.5	3.5	---	---	---	---
124---------- Exeter	500	4	7	---	7	650	---
125---------- Exeter	400	4	---	---	---	---	---
131---------- Grangeville	---	3	---	---	---	---	---
132---------- Greenfield	500	4	7	---	8.5	---	2
134---------- Havala	500	4	7	---	---	650	---
135---------- Havala	500	4	---	---	---	---	---
139---------- Honcut	500	4	7	---	8.5	---	2
145---------- Lewis	---	1	---	---	---	---	---
147---------- Porterville	500	4	4.9	---	---	700	---
148, 149---------- Porterville	500	4	---	---	---	---	---
150---------- Porterville	400	---	---	---	---	---	---
153---------- San Emigdio	500	---	---	---	---	750	---
154---------- San Joaquin	400	4	7	---	6.5	600	---
155---------- San Joaquin	300	4	---	---	---	---	---
159---------- Seville	500	3	4.2	---	7.5	600	---
164---------- Tujunga	300	2	---	---	6.5	---	1.5
172---------- Wyman	500	4	7	---	---	600	---

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Oranges	Olives[2]	Plums[3]	Almonds	Table grapes	Cotton lint	Walnuts
	Box[1]	Ton	Ton	Lb[4]	Ton	Lb	Ton[5]
173---------- Wyman	---	4	---	---	---	---	---
174---------- Wyman	500	4	---	---	---	---	---
176---------- Yettem	500	4	7	---	8.5	---	2

1 52 pound field box.
2 Olive yields based on Manzannillo variety.
3 Plum yields based on Santa Rosa variety.
4 Pounds of almonds without shells.
5 Tons of walnuts with shells.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
100, 101, 102, 103--Auberry	Coarse Loamy (18)	Favorable	3,500	Soft chess	25
		Normal	2,800	Blue oak	15
		Unfavorable	1,500	Wild oats	10
				Filaree	10
				Burclover	10
				Interior live oak	10
				Ripgut brome	5
				Wedgeleaf ceanothus	5
				Clover	5
				Manzanita	5
104*:					
Auberry	Coarse Loamy (18)	Favorable	3,500	Soft chess	25
		Normal	2,800	Blue oak	15
		Unfavorable	1,500	Wild oats	10
				Filaree	10
				Burclover	10
				Interior live oak	10
				Ripgut brome	5
				Wedgeleaf ceanothus	5
				Clover	5
				Manzanita	5
Rock outcrop.					
105, 106, 107--Blasingame	Coarse Loamy (18)	Favorable	3,500	Soft chess	25
		Normal	3,000	Blue oak	20
		Unfavorable	1,000	Filaree	15
				Wild oats	10
				Ripgut brome	10
				Burclover	5
				Foxtail fescue	5
				Interior live oak	5
108*:					
Blasingame	Coarse Loamy (18)	Favorable	3,500	Soft chess	25
		Normal	3,000	Blue oak	20
		Unfavorable	1,000	Filaree	15
				Wild oats	10
				Ripgut brome	10
				Foxtail fescue	5
				Interior live oak	5
Rock outcrop.					
110, 111, 112--Centerville	Clayey (17)	Favorable	3,500	Soft chess	35
		Normal	2,800	Burclover	25
		Unfavorable	2,000	Filaree	20
				Wild oats	10
				Ripgut brome	5
113, 114--Cibo	Clayey (18)	Favorable	4,000	Soft chess	35
		Normal	3,000	Burclover	25
		Unfavorable	2,000	Filaree	20
				Wild oats	10
				Ripgut brome	5
115*:					
Cibo	Clayey (18)	Favorable	4,000	Soft chess	35
		Normal	3,000	Burclover	25
		Unfavorable	2,000	Filaree	20
				Wild oats	10
				Ripgut brome	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
115*: Rock outcrop.					
116*: Cleneba	Shallow Coarse Loamy (18)	Favorable	1,800	Soft chess	20
		Normal	1,200	Filaree	15
		Unfavorable	1,000	Blue oak	15
				Wild oats	10
				Ripgut brome	10
				Interior live oak	10
Rock outcrop.					
117 Clear Lake	Clayey Flat (17)	Favorable	3,500	Soft chess	30
		Normal	2,800	Burclover	25
		Unfavorable	1,800	Redstem filaree	15
				Wild oats	10
				Ripgut brome	5
118, 119 Coarsegold	Loamy (18)	Favorable	3,500	Soft chess	20
		Normal	3,000	Blue oak	20
		Unfavorable	2,000	Wild oats	10
				Ripgut brome	10
				Burclover	10
				Filaree	10
				Foxtail fescue	5
				Clover	5
				Interior live oak	5
120*: Coarsegold	Loamy (18)	Favorable	3,500	Soft chess	20
		Normal	3,000	Blue oak	20
		Unfavorable	2,000	Wild oats	10
				Ripgut brome	10
				Burclover	10
				Filaree	10
				Foxtail fescue	5
				Clover	5
				Interior live oak	5
Rock outcrop.					
125 Exeter	Loamy Hardpan (17)	Favorable	2,400	Soft chess	25
		Normal	1,800	Filaree	20
		Unfavorable	1,000	Wild oats	15
				Burclover	10
				Ripgut brome	10
				Mouse barley	5
126, 127, 128 Fallbrook	Coarse Loamy (18)	Favorable	3,500	Soft chess	25
		Normal	3,000	Filaree	15
		Unfavorable	1,800	Blue oak	15
				Wild oats	10
				Ripgut brome	10
				Foxtail fescue	5
				Burclover	5
				Interior live oak	5
				Wedgeleaf ceanothus	5
129*: Fallbrook	Coarse Loamy (18)	Favorable	3,500	Soft chess	25
		Normal	3,000	Filaree	15
		Unfavorable	1,800	Blue oak	15
				Wild oats	10
				Ripgut brome	10
				Foxtail fescue	5
				Burclover	5
				Interior live oak	5
				Wedgeleaf ceanothus	5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
129*:					
Rock outcrop.					
130*:					
Friant	Shallow Coarse Loamy (18)	Favorable	1,800	Soft chess	35
		Normal	1,200	Wild oats	20
		Unfavorable	1,000	Filaree	15
				Burclover	10
				Ripgut brome	5
				Red brome	5
Rock outcrop.					
131 Grangeville	Loamy (17)	Favorable	3,000	Soft chess	35
		Normal	2,500	Burclover	15
		Unfavorable	1,000	Filaree	15
				Ripgut brome	10
				Wild oats	10
				Clover	5
133 Greenfield	Coarse Loamy (17)	Favorable	3,500	Soft chess	30
		Normal	2,800	Filaree	20
		Unfavorable	1,000	Ripgut brome	15
				Wild oats	10
				Burclover	10
135 Havala	Loamy (17)	Favorable	3,500	Soft chess	35
		Normal	2,500	Filaree	20
		Unfavorable	1,000	Wild oats	15
				Ripgut brome	10
				Burclover	10
				Foxtail fescue	5
				Mouse barley	5
138*:					
Rock outcrop.					
140 Honcut	Coarse Loamy (17)	Favorable	3,500	Soft chess	25
		Normal	2,800	Wild oats	20
		Unfavorable	1,000	Burclover	15
				Filaree	15
				Ripgut brome	5
				Foxtail fescue	5
				Mouse barley	5
				White oak	5
141, 142, 143 Las Posas	Loamy (17)	Favorable	3,500	Soft chess	20
		Normal	3,000	Blue oak	20
		Unfavorable	2,000	Wild oats	15
				Filaree	15
				Burclover	5
				Ripgut brome	5
				Interior live oak	5
				Mouse barley	5
144*:					
Las Posas	Loamy (17)	Favorable	3,500	Soft chess	20
		Normal	3,000	Blue oak	20
		Unfavorable	2,000	Wild oats	15
				Filaree	15
				Burclover	5
				Ripgut brome	5
				Interior live oak	5
				Mouse barley	5
Rock outcrop.					

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
145---------- Lewis	Alkali Hardpan (17)----------	Favorable Normal Unfavorable	1,800 1,200 800	Filaree---------- Saltgrass---------- Alkali mallow---------- Soft chess---------- Alkali blite---------- Mouse barley----------	30 20 10 10 5 5
148, 149---------- Porterville	Clayey (17)----------	Favorable Normal Unfavorable	2,800 2,000 1,200	Soft chess---------- Burclover---------- Wild oats---------- Filaree---------- Ripgut brome----------	35 25 15 15 5
150---------- Porterville	Cobbly Clayey (17)----------	Favorable Normal Unfavorable	2,200 1,600 1,000	Soft chess---------- Burclover---------- Filaree---------- Wild oats---------- Ripgut brome----------	35 25 15 10 5
153---------- San Emigdio	Calcareous Loamy (17)----------	Favorable Normal Unfavorable	3,500 2,200 1,800	Soft chess---------- Filaree---------- Saltgrass---------- Ripgut brome---------- Mouse barley---------- Dropseed---------- Wild oats---------- Burclover----------	15 15 10 10 10 10 5 5
155---------- San Joaquin	Loamy (17)----------	Favorable Normal Unfavorable	3,200 2,500 1,000	Soft chess---------- Ripgut brome---------- Wild oats---------- Foxtail fescue---------- Red brome---------- Filaree---------- Mouse barley---------- Clover---------- Burclover---------- Annual lupine----------	25 15 10 10 10 10 5 5 5 5
156, 157, 158------ Sesame	Coarse Loamy (18)----------	Favorable Normal Unfavorable	3,500 2,800 1,700	Soft chess---------- Wild oats---------- Filaree---------- Blue oak---------- Burclover---------- Ripgut brome---------- Mouse barley----------	25 15 15 10 10 10 5
160*: Sheephead--------- Rock outcrop.	Shallow Coarse Loamy (22)-----	Favorable Normal Unfavorable	4,000 3,200 2,500	Manzanita---------- Ceanothus---------- Interior live oak---------- Mountain brome---------- Blue wildrye---------- Bear clover----------	25 20 10 5 5 5
161, 162---------- Trabuco	Loamy (18)----------	Favorable Normal Unfavorable	3,800 3,000 2,000	Soft chess---------- Burclover---------- Wild oats---------- Filaree---------- Ceanothus---------- Foxtail fescue---------- Clover---------- Blue oak---------- Interior live oak---------- Redberry---------- Birchleaf Mt. mahogany--------	25 15 10 10 5 5 5 5 5 5 5

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
163*:					
Trabuco	Loamy (18)	Favorable	3,800	Soft chess	25
		Normal	3,000	Burclover	15
		Unfavorable	2,000	Wild oats	10
				Filaree	10
				Ceanothus	5
				Foxtail fescue	5
				Clover	5
				Blue oak	5
				Interior live oak	5
				Redberry	5
				Birchleaf Mt. mahogany	5
Rock outcrop.					
164	Sandy (17)	Favorable	1,500	Filaree	20
Tujunga		Normal	1,000	Soft chess	20
		Unfavorable	500	Wild oats	10
				Red brome	10
				Ripgut brome	10
				Mouse barley	10
				Foxtail fescue	5
165, 166, 167	Coarse Loamy (18)	Favorable	3,500	Blue oak	20
Vista		Normal	2,800	Soft chess	20
		Unfavorable	1,900	Filaree	15
				Wild oats	10
				Ripgut brome	5
				Burclover	5
				Foxtail fescue	5
168*:					
Vista	Coarse Loamy (18)	Favorable	3,500	Soft chess	20
		Normal	2,800	Blue oak	20
		Unfavorable	2,000	Filaree	15
				Wild oats	10
				Ripgut brome	5
				Burclover	5
				Foxtail fescue	5
Rock outcrop.					
169, 170	Coarse Loamy (18)	Favorable	3,500	Soft chess	20
Walong		Normal	2,800	Wild oats	15
		Unfavorable	2,000	Filaree	15
				Blue oak	10
				Ripgut brome	5
				Burclover	5
				Pine bluegrass	5
				Foxtail fescue	5
				Clover	5
				Interior live oak	5
171*:					
Walong	Coarse Loamy (18)	Favorable	3,500	Soft chess	20
		Normal	2,800	Wild oats	15
		Unfavorable	2,000	Filaree	15
				Ripgut brome	5
				Blue oak	5
				Burclover	5
				Pine bluegrass	5
				Foxtail fescue	5
				Clover	5
				Interior live oak	5
Rock outcrop.					

See footnote at end of table.

TABLE 6.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
173---------- Wyman	Loamy (17)----------	Favorable	3,500	Soft chess----------	20
		Normal	2,500	Wild oats----------	20
		Unfavorable	1,000	Foxtail barley----------	15
				Ripgut brome----------	10
				Filaree----------	10
				Burclover----------	10
175*---------- Xerofluvents	Stony Coarse Loamy (18)--------	Favorable	3,500	Ceanothus----------	30
		Normal	3,000	Interior live oak----------	30
		Unfavorable	1,000	Soft chess----------	15
				Filaree----------	10
				Burclover----------	5
177---------- Yettem	Coarse Loamy (17)----------	Favorable	3,200	Soft chess----------	35
		Normal	2,500	Wild oats----------	20
		Unfavorable	1,000	Filaree----------	15
				Ripgut brome----------	5
				Clover----------	5
				Mouse barley----------	5
				Burclover----------	5
				Foxtail fescue----------	5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
100 Auberry	Slight	Slight	Severe: slope.	Slight.
101 Auberry	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
102 Auberry	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
103 Auberry	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
104*: Auberry Rock outcrop.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
105 Blasingame	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
106 Blasingame	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
107 Blasingame	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
108*: Blasingame Rock outcrop.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
109, 110 Centerville	Moderate: percs slowly, too clayey.	Moderate: percs slowly, too clayey.	Severe: too clayey.	Moderate: too clayey.
111 Centerville	Moderate: slope, percs slowly, too clayey.	Moderate: slope, percs slowly, too clayey.	Severe: slope, too clayey.	Moderate: too clayey.
112 Centerville	Severe: slope.	Severe: slope, too clayey.	Severe: slope, too clayey.	Moderate: too clayey, slope.
113 Cibo	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Moderate: too clayey, slope.
114 Cibo	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.
115*: Cibo Rock outcrop.	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
116*: Cieneba	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Rock outcrop.				
117 Clear Lake	Severe: floods.	Moderate: too clayey.	Severe: too clayey.	Moderate: too clayey.
118 Coarsegold	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
119 Coarsegold	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
120*: Coarsegold	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.				
121 Crouch	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
122 Crouch	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
123*: Crouch	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.				
124 Exeter	Slight	Slight	Moderate: cemented pan.	Slight.
125 Exeter	Slight	Slight	Moderate: slope, cemented pan.	Slight.
126 Fallbrook	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
127 Fallbrook	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
128 Fallbrook	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
129*: Fallbrook	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.				
130*: Friant	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Rock outcrop.				
131 Grangeville	Severe: floods.	Moderate: dusty.	Moderate: dusty.	Slight.
132 Greenfield	Slight	Slight	Moderate: small stones.	Slight.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
133--Greenfield	Slight	Slight	Moderate: slope, small stones.	Slight.
134--Havala	Slight	Slight	Moderate: small stones.	Slight.
135--Havala	Slight	Slight	Moderate: slope, small stones.	Slight.
136--Holland	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
137--Holland	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
138*: Holland	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.				
139--Honcut	Slight	Slight	Moderate: small stones.	Slight.
140--Honcut	Slight	Slight	Moderate: slope, small stones.	Slight.
141--Las Posas	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
142--Las Posas	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
143--Las Posas	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
144*: Las Posas	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.				
145--Lewis	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
146*. Pits				
147, 148--Porterville	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.	Moderate: too clayey.
149--Porterville	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope, too clayey.	Moderate: too clayey.
150--Porterville	Moderate: slope, large stones, percs slowly.	Moderate: slope, large stones, too clayey.	Severe: large stones, slope, too clayey.	Severe: large stones.
151*. Riverwash				

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
152*. Rock outcrop				
153---- San Emigdio	Slight----	Slight----	Slight----	Slight.
154---- San Joaquin	Moderate: percs slowly.	Slight----	Moderate: percs slowly, cemented pan.	Slight.
155---- San Joaquin	Moderate: percs slowly.	Slight----	Moderate: slope, percs slowly, cemented pan.	Slight.
156---- Sesame	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
157---- Sesame	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
158---- Sesame	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
159---- Seville	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.	Moderate: too clayey.
160*: Sheephead----	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Rock outcrop.				
161---- Trabuco	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
162---- Trabuco	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
163*: Trabuco----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.				
164---- Tujunga	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
165---- Vista	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
166---- Vista	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
167---- Vista	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
168*: Vista----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.				
169---- Walong	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
170--Walong	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
171*: Walong	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.				
172--Wyman	Slight	Slight	Slight	Slight.
173--Wyman	Slight	Slight	Moderate: slope.	Slight.
174--Wyman	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
175*. Xerofluvents				
176--Yettem	Slight	Slight	Slight	Slight.
177--Yettem	Slight	Slight	Moderate: slope.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
100, 101, 102---- Auberry	Fair	Good	Good	Good	---	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
103---- Auberry	Poor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
104*: Auberry---- Rock outcrop.	Poor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
105, 106---- Blasingame	Fair	Good	Good	Good	---	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
107---- Blasingame	Poor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
108*: Blasingame---- Rock outcrop.	Poor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
109---- Centerville	Fair	Fair	Good	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
110, 111, 112---- Centerville	Poor	Fair	Good	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
113---- Cibo	Fair	Good	Good	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
114---- Cibo	Poor	Fair	Good	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
115*: Cibo---- Rock outcrop.	Poor	Fair	Good	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
116*: Cleneba---- Rock outcrop.	Very poor.	Very poor.	Poor	---	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
117---- Clear Lake	Fair	Good	Fair	---	---	Poor	Very poor.	Very poor.	Good	---	Very poor.	Fair.
118---- Coarsegold	Fair	Good	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
119---- Coarsegold	Poor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
120*: Coarsegold---- Rock outcrop.	Poor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
121---------- Crouch	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
122---------- Crouch	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
123*: Crouch----------	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Rock outcrop.												
124---------- Exeter	Fair	Good	Good	---	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
125---------- Exeter	Fair	Good	Good	---	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
126, 127---------- Fallbrook	Fair	Good	Good	Good	---	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
128---------- Fallbrook	Poor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
129*: Fallbrook----------	Poor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Rock outcrop.												
130*: Friant----------	Poor	Very poor.	Fair	---	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
Rock outcrop.												
131---------- Grangeville	Fair	Good	Good	Good	---	Good	Fair	Poor	Good	---	Poor	Good.
132---------- Greenfield	Good	Good	Good	---	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
133---------- Greenfield	Fair	Good	Good	---	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
134---------- Havala	Good	Good	Good	---	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
135---------- Havala	Fair	Fair	Good	---	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
136---------- Holland	Fair	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
137---------- Holland	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
138*: Holland----------	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Rock outcrop.												
139---------- Honcut	Good	Good	Good	---	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
140---------- Honcut	Fair	Good	Good	---	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
141, 142---------- Las Posas	Fair	Good	Good	Good	---	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
143---------- Las Posas	Poor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
144*: Las Posas---------	Poor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Rock outcrop.												
145---------- Lewis	Fair	Fair	Poor	---	---	Very poor.	Good	Fair	Poor	---	Fair	Very poor.
146*. Pits												
147, 148, 149------ Porterville	Fair	Good	Good	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
150---------- Porterville	Fair	Fair	Good	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
151*. Riverwash												
152*. Rock outcrop												
153---------- San Emigdio	Fair	Good	Good	---	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
154---------- San Joaquin	Fair	Good	Fair	---	---	Fair	Fair	Fair	Fair	---	Fair	Fair.
155---------- San Joaquin	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
156, 157---------- Sesame	Fair	Good	Good	Good	---	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
158---------- Sesame	Poor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
159---------- Seville	Fair	Fair	Fair	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
160*: Sheephead---------	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
Rock outcrop.												
161---------- Trabuco	Fair	Good	Good	Good	---	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
162---------- Trabuco	Poor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
163*: Trabuco	Poor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Rock outcrop.												
164 Tujunga	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
165 Vista	Fair	Good	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
166 Vista	Fair	Good	Fair	Fair	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
167 Vista	Poor	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
168*: Vista	Poor	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Rock outcrop.												
169 Walong	Fair	Good	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
170 Walong	Poor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
171*: Walong	Poor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Rock outcrop.												
172, 173 Wyman	Fair	Good	Good	---	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
174 Wyman	Poor	Poor	Good	---	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
175*. Xerofluvents												
176, 177 Yettem	Fair	Good	Good	---	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
100 Auberry	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: low strength, shrink-swell.
101 Auberry	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, shrink-swell.
102, 103 Auberry	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
104*: Auberry	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
105 Blasingame	Moderate: depth to rock, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, shrink-swell, slope.	Severe: slope.	Moderate: depth to rock, slope, shrink-swell.
106, 107 Blasingame	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
108*: Blasingame	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
109, 110 Centerville	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.
111 Centerville	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength, slope.	Severe: low strength, shrink-swell.
112 Centerville	Severe: too clayey, slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.	Severe: low strength, shrink-swell, slope.
113, 114 Cibo	Severe: depth to rock, too clayey, slope.	Severe: shrink-swell, low strength, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, low strength, slope.	Severe: low strength, slope, shrink-swell.
115*: Cibo	Severe: depth to rock, too clayey, slope.	Severe: shrink-swell, low strength, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, low strength, slope.	Severe: low strength, slope, shrink-swell.
Rock outcrop.					
116*: Cleneba	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
116*: Rock outcrop.					
117---------- Clear Lake	Severe: too clayey.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: shrink-swell, low strength.
118, 119---------- Coarsegold	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
120*: Coarsegold-------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
121, 122---------- Crouch	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
123*: Crouch----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
124---------- Exeter	Moderate: cemented pan.	Moderate: shrink-swell.	Moderate: cemented pan, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
125---------- Exeter	Moderate: cemented pan.	Moderate: shrink-swell.	Moderate: cemented pan, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
126---------- Fallbrook	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Moderate: low strength, slope, shrink-swell.
127, 128---------- Fallbrook	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
129*: Fallbrook--------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
130*: Friant----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
131---------- Grangeville	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, low strength.
132, 133---------- Greenfield	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
134, 135---------- Havala	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
136, 137---------- Holland	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
138*: Holland----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Rock outcrop.					
139, 140---------- Honcut	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
141---------- Las Posas	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: shrink-swell, low strength.
142, 143---------- Las Posas	Severe: slope, too clayey.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.
144*: Las Posas--------	Severe: slope, too clayey.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.
Rock outcrop.					
145---------- Lewis	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
146*. Pits					
147, 148---------- Porterville	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: low strength, shrink-swell.
149, 150---------- Porterville	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength, slope.	Severe: low strength, shrink-swell.
151*. Riverwash					
152*. Rock outcrop					
153---------- San Emigdio	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: low strength.
154, 155---------- San Joaquin	Severe: cemented pan.	Severe: shrink-swell.	Severe: shrink-swell, cemented pan.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
156---------- Sesame	Moderate: depth to rock, slope.	Moderate: shrink-swell, low strength, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Moderate: slope, low strength, shrink-swell.
157, 158---------- Sesame	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
159---------- Seville	Severe: too clayey, cemented pan.	Severe: shrink-swell, low strength.	Severe: shrink-swell, cemented pan, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.
160*: Sheephead--------	Severe: slope, depth to rock.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: slope.
Rock outcrop.					
161, 162---------- Trabuco	Severe: slope, too clayey.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.	Severe: low strength, slope, shrink-swell.
163*: Trabuco----------	Severe: slope, too clayey.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength, slope.	Severe: low strength, slope, shrink-swell.
Rock outcrop.					
164---------- Tujunga	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Slight.
165---------- Vista	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.
166, 167---------- Vista	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
168*: Vista----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
169, 170---------- Walong	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
171*: Walong----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
172, 173, 174----- Wyman	Moderate: too clayey.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.
175*. Xerofluvents					
176, 177---------- Yettem	Slight----------	Slight----------	Slight----------	Slight----------	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
100--Auberry	Severe: percs slowly.	Severe: seepage, slope.	Severe: depth to rock, seepage.	Severe: seepage.	Good.
101--Auberry	Severe: percs slowly.	Severe: seepage, slope.	Severe: depth to rock, seepage.	Severe: seepage.	Fair: slope.
102--Auberry	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: depth to rock, seepage.	Severe: seepage, slope.	Poor: slope.
103--Auberry	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: slope.
104*: Auberry	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: slope.
Rock outcrop.					
105--Blasingame	Severe: depth to rock, percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, area reclaim.
106--Blasingame	Severe: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
107--Blasingame	Severe: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope, thin layer, area reclaim.
108*: Blasingame	Severe: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Rock outcrop.					
109--Centerville	Severe: depth to rock, percs slowly.	Moderate: depth to rock.	Severe: too clayey, depth to rock.	Slight	Poor: too clayey, area reclaim.
110--Centerville	Severe: depth to rock, percs slowly.	Moderate: depth to rock, slope.	Severe: too clayey, depth to rock.	Slight	Poor: too clayey, area reclaim.
111--Centerville	Severe: depth to rock, percs slowly.	Severe: slope.	Severe: too clayey, depth to rock.	Moderate: slope.	Poor: too clayey, area reclaim.
112--Centerville	Severe: depth to rock, percs slowly, slope.	Severe: slope.	Severe: too clayey, depth to rock.	Severe: slope.	Poor: too clayey, slope, area reclaim.

See footnotes at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
113---------- Cibo	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: slope.	Poor: too clayey, slope, thin layer.
114---------- Cibo	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey, slope.	Severe: slope.	Poor: too clayey, slope, thin layer.
115*: Cibo----------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey, slope.	Severe: slope.	Poor: too clayey, slope, thin layer.
Rock outcrop.					
116*: Cieneba----------	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage, slope.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
Rock outcrop.					
117---------- Clear Lake	Severe: percs slowly.	Slight----------	Severe: too clayey.	Moderate: floods.	Poor: too clayey.
118---------- Coarsegold	Severe: percs slowly, slope, depth to rock.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
119---------- Coarsegold	Severe: percs slowly, slope, depth to rock.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope, thin layer, area reclaim.
120*: Coarsegold---------	Severe: percs slowly, slope, depth to rock.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Rock outcrop.					
121---------- Crouch	Severe: slope.	Severe: slope, seepage.	Severe: seepage, depth to rock.	Severe: slope, seepage.	Poor: slope.
122---------- Crouch	Severe: slope.	Severe: slope, seepage.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage.	Poor: slope.
123*: Crouch----------	Severe: slope.	Severe: slope, seepage.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage.	Poor: slope.
Rock outcrop.					
124, 125---------- Exeter	Severe: cemented pan, percs slowly.	Severe: seepage, cemented pan.	Severe: seepage.	Slight----------	Fair: thin layer, area reclaim.

See footnotes at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
126---------- Fallbrook	Severe: depth to rock, percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Fair: slope, area reclaim.
127---------- Fallbrook	Severe: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
128---------- Fallbrook	Severe: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
129*: Fallbrook----------	Severe: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Rock outcrop.					
130*: Friant----------	Severe: slope, depth to rock.	Severe: depth to rock, slope, seepage.	Severe: slope, depth to rock.	Severe: seepage, slope.	Poor: slope, area reclaim, thin layer.
Rock outcrop.					
131---------- Grangeville	Moderate: floods.	Severe: floods, seepage.	Severe: seepage.	Severe: seepage.	Good.
132, 133---------- Greenfield	Slight----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
134, 135---------- Havala	Severe: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too clayey.
136---------- Holland	Severe: percs slowly, slope.	Severe: slope.	Moderate: too clayey, slope.	Severe: slope.	Poor: slope.
137---------- Holland	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
138*: Holland----------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Rock outcrop.					
139, 140---------- Honcut	Slight----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
141---------- Las Posas	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: too clayey, depth to rock.	Moderate: slope.	Poor: too clayey, thin layer, area reclaim.
142---------- Las Posas	Severe: depth to rock, percs slowly, slope.	Severe: slope, depth to rock.	Severe: too clayey, depth to rock.	Severe: slope.	Poor: slope, too clayey, area reclaim.

See footnotes at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
143---------- Las Posas	Severe: depth to rock, percs slowly, slope.	Severe: slope, depth to rock.	Severe: slope, too clayey, depth to rock.	Severe: slope.	Poor: slope, too clayey, area reclaim.
144*: Las Posas----------	Severe: depth to rock, percs slowly, slope.	Severe: slope, depth to rock.	Severe: slope, too clayey, depth to rock.	Severe: slope.	Poor: slope, too clayey, area reclaim.
Rock outcrop.					
145---------- Lewis	Severe: percs slowly, cemented pan.	Severe: cemented pan, seepage.	Severe: too clayey, cemented pan.	Slight----------	Poor: thin layer, too clayey, area reclaim.
146*. Pits					
147---------- Porterville	Severe: percs slowly.	Slight----------	Severe: too clayey.	Slight----------	Poor: too clayey.
148---------- Porterville	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey.
149, 150---------- Porterville	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
151*. Riverwash					
152*. Rock outcrop					
153---------- San Emigdio	Slight----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
154---------- San Joaquin	Severe: percs slowly, cemented pan.	Moderate: seepage, cemented pan.	Severe: cemented pan.	Slight----------	Fair: thin layer, area reclaim.
155---------- San Joaquin	Severe: percs slowly, cemented pan.	Moderate: seepage, cemented pan, slope.	Severe: cemented pan.	Slight----------	Fair: thin layer, area reclaim.
156---------- Sesame	Severe: depth to rock.	Severe: seepage, slope.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: thin layer, area reclaim.
157---------- Sesame	Severe: slope, depth to rock.	Severe: seepage, slope.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
158---------- Sesame	Severe: slope, depth to rock.	Severe: seepage, slope.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
159---------- Seville	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: too clayey.	Slight----------	Poor: too clayey, area reclaim.

See footnotes at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
160*: Sheephead	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Rock outcrop.					
161 Trabuco	Severe: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: too clayey, slope.
162 Trabuco	Severe: depth to rock, percs slowly, slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Poor: too clayey, slope.
163*: Trabuco	Severe: depth to rock, percs slowly, slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Poor: too clayey, slope.
Rock outcrop.					
164 Tujunga	Slight**	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
165 Vista	Severe: depth to rock.	Severe: slope, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: thin layer, area reclaim.
166 Vista	Severe: slope, depth to rock.	Severe: slope, seepage.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: thin layer, area reclaim, slope.
167 Vista	Severe: slope, depth to rock.	Severe: slope, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: thin layer, area reclaim, slope.
168*: Vista	Severe: slope, depth to rock.	Severe: slope, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: thin layer, area reclaim, slope.
Rock outcrop.					
169 Walong	Severe: depth to rock, slope.	Severe: seepage, slope, depth to rock.	Severe: depth to rock, seepage.	Severe: seepage, slope.	Poor: slope, thin layer, area reclaim.
170 Walong	Severe: depth to rock, slope.	Severe: seepage, slope, depth to rock.	Severe: depth to rock, slope, seepage.	Severe: seepage, slope.	Poor: slope, thin layer, area reclaim.
171*: Walong	Severe: depth to rock, slope.	Severe: seepage, slope, depth to rock.	Severe: depth to rock, slope, seepage.	Severe: seepage, slope.	Poor: slope, thin layer, area reclaim.

See footnotes at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
171*: Rock outcrop.					
172---------- Wyman	Severe: percs slowly.	Moderate: seepage.	Severe: seepage.	Slight----------	Fair: too clayey.
173---------- Wyman	Severe: percs slowly.	Moderate: seepage, slope.	Severe: seepage.	Slight----------	Fair: too clayey.
174---------- Wyman	Severe: percs slowly.	Moderate: seepage.	Severe: seepage.	Slight----------	Fair: too clayey, small stones.
175*. Xerofluvents					
176, 177---------- Yettem	Slight----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.
** Excessive permeability can cause pollution of ground water.

TABLE 11.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
100--- Auberry	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
101--- Auberry	Fair: low strength, slope, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
102, 103--- Auberry	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
104[1]: Auberry---	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Rock outcrop.				
105--- Blasingame	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, small stones, slope.
106--- Blasingame	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
107--- Blasingame	Poor: thin layer, slope, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
108[1]: Blasingame---	Poor: thin layer, slope, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Rock outcrop.				
109, 110, 111--- Centerville	Poor: shrink-swell, low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
112--- Centerville	Poor: shrink-swell, low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, slope.
113--- Cibo	Poor: low strength, shrink-swell, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, slope.
114--- Cibo	Poor: low strength, slope, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, slope.

See footnotes at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
115[1]:				
Cibo	Poor: low strength, slope, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, slope.
Rock outcrop.				
116[1]:				
Cleneba	Poor: slope, thin layer, area reclaim.	Poor: excess fines, thin layer.	Unsuited: excess fines.	Poor: slope, area reclaim.
Rock outcrop.				
117, Clear Lake	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
118, Coarsegold	Poor: area reclaim, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones, slope.
119, Coarsegold	Poor: slope, area reclaim, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones, slope.
120[1]:				
Coarsegold	Poor: slope, area reclaim, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones, slope.
Rock outcrop.				
121, Crouch	Fair: slope.	Poor: excess fines.	Unsuited: excess fines.	Poor: slope.
122, Crouch	Poor: slope.	Poor: excess fines.	Unsuited: excess fines.	Poor: slope.
123[1]:				
Crouch	Poor: slope.	Poor: excess fines.	Unsuited: excess fines.	Poor: slope.
Rock outcrop.				
124, 125, Exeter	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
126, Fallbrook	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones, too clayey, slope.
127, Fallbrook	Fair: low strength, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
128, Fallbrook	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
129[1]:				
Fallbrook	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Rock outcrop.				

See footnotes at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
130[1]: Friant	Poor: slope, thin layer, area reclaim.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Poor: slope, area reclaim.
Rock outcrop.				
131 Grangeville	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
132, 133 Greenfield	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
134, 135 Havala	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones.
136 Holland	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
137 Holland	Poor: low strength, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
138[1]: Holland	Poor: low strength, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Rock outcrop.				
139, 140 Honcut	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Fair: small stones.
141 Las Posas	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones, thin layer, slope.
142 Las Posas	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
143 Las Posas	Poor: slope, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
144[1]: Las Posas	Poor: slope, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Rock outcrop.				
145 Lewis	Poor: low strength, shrink-swell, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, excess sodium.
146[1]: Pits				
147, 148, 149 Porterville	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.

See footnotes at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
150--- Porterville	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, large stones.
151[1]: Riverwash				
152[1]: Rock outcrop				
153--- San Emigdio	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
154, 155--- San Joaquin	Poor: low strength, shrink-swell, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim, thin layer.
156--- Sesame	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, slope, area reclaim.
157--- Sesame	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
158--- Sesame	Poor: thin layer, area reclaim, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
159--- Seville	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
160[1]: Sheephead---	Poor: slope, thin layer, area reclaim.	Poor: thin layer, excess fines.	Unsuited: excess fines.	Poor: thin layer, slope.
Rock outcrop.				
161--- Trabuco	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
162--- Trabuco	Poor: low strength, slope, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
163[1]: Trabuco---	Poor: low strength, slope, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Rock outcrop.				
164--- Tujunga	Good---	Fair: excess fines.	Unsuited:[2] excess fines.	Poor: too sandy.
165--- Vista	Poor:[3] thin layer, area reclaim.	Unsuited: thin layer.	Unsuited:[3] excess fines.	Fair:[4] slope, area reclaim.

See footnotes at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
166--- Vista	Poor:[3] thin layer, area reclaim.	Unsuited: thin layer.	Unsuited:[3] excess fines.	Poor:[4] slope.
167--- Vista	Poor:[3] thin layer, slope, area reclaim.	Unsuited: thin layer.	Unsuited:[3] excess fines.	Poor:[4] slope.
168[1]: Vista---	Poor:[3] thin layer, slope, area reclaim.	Unsuited: thin layer.	Unsuited:[3] excess fines.	Poor:[4] slope.
Rock outcrop.				
169--- Walong	Poor: thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: slope.
170--- Walong	Poor: slope, thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: slope.
171[1]: Walong---	Poor: slope, thin layer, area reclaim.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: slope.
Rock outcrop.				
172, 173--- Wyman	Poor: low strength.	Poor: excess fines.	Poor: excess fines.	Fair: small stones, too clayey.
174--- Wyman	Poor: low strength.	Poor: excess fines.	Fair: excess fines.	Poor: small stones.
175[1]. Xerofluvents				
176, 177--- Yettem	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.

[1] See description of the map unit for composition and behavior characteristics of the map unit.
[2] A good source of gravel may be below 60 inches.
[3] Granitic bedrock is a good source of decomposed granite.
[4] Fragments are mostly the size of fine gravel.

TABLE 12.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
100, 101, 102, 103--- Auberry	Slope, seepage.	Piping---	Slope---	Slope---	Slope---	Slope.
104*: Auberry---	Slope, seepage.	Piping---	Slope---	Slope---	Slope---	Slope.
Rock outcrop.						
105, 106, 107--- Blasingame	Depth to rock, slope.	Thin layer---	Depth to rock, slope.	Rooting depth, slope, erodes easily.	Slope, depth to rock.	Slope, erodes easily, depth to rock.
108*: Blasingame---	Depth to rock, slope.	Thin layer---	Depth to rock, slope.	Rooting depth, slope, erodes easily.	Slope, depth to rock.	Slope, erodes easily, depth to rock.
Rock outcrop.						
109--- Centerville	Favorable---	Hard to pack, shrink-swell, low strength.	Percs slowly---	Slow intake, percs slowly.	Percs slowly, depth to rock.	Percs slowly.
110, 111, 112--- Centerville	Slope---	Hard to pack, shrink-swell, low strength.	Percs slowly---	Slope, slow intake, percs slowly.	Slope, percs slowly, depth to rock.	Slope, percs slowly.
113, 114--- Cibo	Depth to rock, slope.	Hard to pack, shrink-swell, low strength.	Percs slowly, depth to rock, slope.	Percs slowly, rooting depth, slope.	Percs slowly, slope, depth to rock.	Percs slowly, depth to rock, slope.
115*: Cibo---	Depth to rock, slope.	Hard to pack, shrink-swell, low strength.	Percs slowly, depth to rock, slope.	Percs slowly, rooting depth, slope.	Percs slowly, slope, depth to rock.	Percs slowly, depth to rock, slope.
Rock outcrop.						
116*: Cleneba---	Slope, depth to rock, seepage.	Thin layer---	Slope, depth to rock.	Slope, rooting depth, droughty.	Slope, depth to rock.	Slope, rooting depth, droughty.
Rock outcrop.						
117--- Clear Lake	Favorable---	Low strength, shrink-swell, hard to pack.	Percs slowly---	Percs slowly, slow intake.	Percs slowly---	Percs slowly.
118, 119--- Coarsegold	Slope, depth to rock.	Thin layer, piping.	Slope---	Slope, rooting depth, erodes easily.	Slope, depth to rock.	Slope, depth to rock, erodes easily.
120*: Coarsegold---	Slope, depth to rock.	Thin layer, piping.	Slope---	Slope, rooting depth, erodes easily.	Slope, depth to rock.	Slope, depth to rock, erodes easily.
Rock outcrop.						
121, 122--- Crouch	Slope, seepage.	Seepage---	Slope---	Slope---	Slope---	Slope.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
123*: Crouch	Slope, seepage.	Seepage	Slope	slope	Slope	Slope.
Rock outcrop.						
124 Exeter	Cemented pan	Piping, hard to pack.	Cemented pan	Rooting depth	Cemented pan, slope.	Slope, rooting dept
125 Exeter	Cemented pan	Piping, hard to pack.	Cemented pan	Rooting depth, slope.	Cemented pan, slope.	Slope, rooting dept
126, 127, 128 Fallbrook	Slope	Piping	Slope	Slope	Slope	Slope.
129*: Fallbrook	Slope	Piping	Slope	Slope	Slope	Slope.
Rock outcrop.						
130*: Friant	Depth to rock, slope, seepage.	Thin layer, piping.	Slope, depth to rock.	Slope, rooting depth.	Slope, depth to rock.	Slope, rooting dept
Rock outcrop.						
131 Grangeville	Seepage	Seepage	Favorable	Favorable	Favorable	Erodes easily
132 Greenfield	Seepage	Seepage	Favorable	Favorable	Favorable	Favorable.
133 Greenfield	Seepage	Seepage	Slope	Slope	Favorable	Favorable.
134 Havala	Seepage	Favorable	Favorable	Favorable	Favorable	Favorable.
135 Havala	Seepage	Favorable	Slope	Slope	Favorable	Favorable.
136, 137 Holland	Slope	Piping	Slope	Slope	Slope	Slope.
138*: Holland	Slope	Piping	Slope	Slope	Slope	Slope.
Rock outcrop.						
139 Honcut	Seepage	Piping, seepage.	Favorable	Favorable	Favorable	Favorable.
140 Honcut	Seepage	Piping, seepage.	Slope	Slope	Favorable	Favorable.
141, 142, 143 Las Posas	Slope, depth to rock.	Hard to pack, thin layer.	Slope, percs slowly, depth to rock.	Slope, percs slowly, rooting depth.	Depth to rock, slope.	Slope, percs slowly depth to roc
144*: Las Posas	Slope, depth to rock.	Hard to pack, thin layer.	Slope, percs slowly, depth to rock.	Slope, percs slowly, rooting depth.	Depth to rock, slope.	Slope, percs slowly depth to roc
Rock outcrop.						

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
45---------- Lewis	Cemented pan---	Low strength, shrink-swell, excess sodium.	Cemented pan, percs slowly, excess sodium.	Excess sodium, excess salt, percs slowly.	Cemented pan, percs slowly, rooting depth.	Excess sodium, excess salt, percs slowly.
46*. Pits						
47---------- Porterville	Favorable------	Hard to pack, shrink-swell, low strength.	Percs slowly---	Slow intake, percs slowly.	Percs slowly---	Percs slowly.
48---------- Porterville	Favorable------	Hard to pack, shrink-swell, low strength.	Percs slowly, slope.	Slope, slow intake, percs slowly.	Percs slowly---	Percs slowly.
49---------- Porterville	Slope----------	Hard to pack, shrink-swell, low strength.	Percs slowly, slope.	Slope, slow intake, percs slowly.	Slope, percs slowly.	Slope, percs slowly.
50---------- Porterville	Slope----------	Hard to pack, shrink-swell, low strength.	Percs slowly---	Large stones, slow intake, percs slowly.	Percs slowly, large stones.	Slope, percs slowly, large stones.
51*. Riverwash						
52*. Rock outcrop						
53---------- San Emigdio	Seepage--------	Favorable------	Favorable------	Favorable------	Favorable------	Favorable.
54---------- San Joaquin	Cemented pan---	Thin layer-----	Cemented pan, percs slowly.	Percs slowly, rooting depth.	Percs slowly, cemented pan.	Percs slowly, cemented pan.
55---------- San Joaquin	Cemented pan---	Thin layer-----	Percs slowly, cemented pan, slope.	Percs slowly, rooting depth, slope.	Percs slowly, cemented pan.	Percs slowly, cemented pan.
56, 157, 158----- Sesame	Seepage, depth to rock, slope.	Thin layer-----	Depth to rock, slope.	Rooting depth, slope, erodes easily.	Depth to rock, slope.	Slope, erodes easily, depth to rock.
59---------- Seville	Cemented pan---	Hard to pack, shrink-swell, low strength.	Cemented pan, percs slowly.	Percs slowly, rooting depth, cemented pan.	Cemented pan, percs slowly.	Percs slowly.
60*: Sheephead--------	Slope, depth to rock, seepage.	Thin layer, seepage.	Slope, depth to rock.	Rooting depth, slope.	Slope, depth to rock.	Slope, droughty, rooting depth.
Rock outcrop.						
61, 162---------- Trabuco	Slope----------	Hard to pack, thin layer.	Slope----------	Slope----------	Slope, percs slowly.	Slope, percs slowly, erodes easily.
63*: Trabuco----------	Slope----------	Hard to pack, thin layer.	Slope----------	Slope----------	Slope, percs slowly.	Slope, percs slowly, erodes easily.
Rock outcrop.						
64---------- Tujunga	Seepage--------	Seepage, piping.	Cutbanks cave	Droughty, fast intake.	Too sandy.	Droughty.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
165, 166, 167----- Vista	Seepage, slope.	Seepage--------	Slope, depth to rock.	Slope, droughty, rooting depth.	Slope, depth to rock.	Slope, droughty, depth to roc
168*: Vista----------	Seepage, slope.	Seepage--------	Slope, depth to rock.	Slope, droughty, rooting depth.	Slope, depth to rock.	Slope, droughty, depth to roc
Rock outcrop.						
169, 170---------- Walong	Slope, depth to rock, seepage.	Thin layer, seepage.	Depth to rock, slope.	Slope, droughty, rooting depth.	Slope.	Slope, droughty, depth to roc
171*: Walong----------	Slope, depth to rock, seepage.	Thin layer, seepage.	Depth to rock, slope.	Slope, droughty, rooting depth.	Slope.	Slope, droughty, depth to roc
Rock outcrop.						
172---------- Wyman	Seepage--------	Favorable------	Favorable------	Favorable------	Erodes easily	Erodes easily
173---------- Wyman	Seepage--------	Favorable------	Slope----------	Slope----------	Erodes easily	Erodes easily
174---------- Wyman	Seepage--------	Favorable------	Favorable------	Favorable------	Favorable------	Erodes easily
175*. Xerofluvents						
176, 177---------- Yettem	Seepage--------	Seepage--------	Favorable------	Favorable------	Favorable------	Favorable.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
100, 101, 102, 103-Auberry	0-16	Sandy loam	SM	A-2, A-4	0	95-100	85-100	50-70	25-45	15-30	NP-5
	16-22	Sandy loam, loam	SM, ML, SM-SC, CL-ML	A-4	0	95-100	90-100	65-85	35-60	15-30	NP-10
	22-43	Clay loam, sandy clay loam, loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0	95-100	90-100	70-85	45-70	25-40	5-15
	43-56	Coarse sandy loam, sandy loam.	SM	A-2, A-4	0	95-100	85-100	50-70	25-45	15-30	NP-5
	56	Weathered bedrock.	---	---	---	---	---	---	---	---	---
104*:											
Auberry	0-16	Sandy loam	SM	A-2, A-4	0	95-100	85-100	50-70	25-45	15-30	NP-5
	16-22	Sandy loam, loam	SM, ML, SM-SC, CL-ML	A-4	0	95-100	90-100	65-85	35-60	15-30	NP-10
	22-43	Clay loam, sandy clay loam, loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0	95-100	90-100	70-85	45-70	25-40	5-15
	43-56	Coarse sandy loam, sandy loam.	SM	A-2, A-4	0	95-100	85-100	50-70	25-45	15-30	NP-5
	56	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
105, 106, 107-Blasingame	0-7	Sandy loam	SM	A-2, A-4	0	95-100	85-95	60-70	25-45	20-30	NP-5
	7-36	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0	95-100	85-100	65-75	35-70	25-40	10-20
	36	Weathered bedrock.	---	---	---	---	---	---	---	---	---
108*:											
Blasingame	0-7	Sandy loam	SM	A-2, A-4	0	95-100	85-95	60-70	25-45	20-30	NP-5
	7-36	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0	95-100	85-100	65-75	35-70	25-40	10-20
	36	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
109, 110, 111, 112-Centerville	0-30	Clay	CH	A-7	0	100	100	90-100	75-95	50-60	25-35
	30-37	Sandy clay, clay.	SC, CL, CH	A-7	0	100	100	85-95	45-90	40-60	20-35
	37	Weathered bedrock.	---	---	---	---	---	---	---	---	---
113, 114-Cibo	0-19	Clay	CL, CH	A-7	0	95-100	95-100	90-100	70-90	40-65	20-35
	19-35	Clay loam, clay.	CL, CH	A-7	0	100	100	90-100	70-90	40-65	20-35
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
115*:											
Cibo	0-19	Clay	CL, CH	A-7	0	95-100	95-100	90-100	70-90	40-65	20-35
	19-35	Clay loam, clay.	CL, CH	A-7	0	100	100	90-100	70-90	40-65	20-35
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
115*:											
Rock outcrop.											
116*:											
Cleneba	0-16	Coarse sandy loam.	SM	A-2, A-4	0	90-100	75-95	50-80	20-50	10-20	NP-5
	16	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
117	0-24	Clay	CH, CL	A-7	0	100	100	95-100	85-95	40-70	20-40
Clear Lake	24-66	Clay, silty clay.	CH, CL	A-7	0	100	100	95-100	85-95	40-70	20-40
118, 119	0-7	Loam	ML	A-4	0-5	80-100	75-95	70-95	50-75	25-35	NP-5
Coarsegold	7-20	Loam, sandy clay loam, clay loam.	SM, ML	A-4, A-6, A-7	0-5	80-100	75-95	60-95	35-65	30-45	5-15
	20-31	Gravelly loam, gravelly clay loam, gravelly sandy clay loam.	SM, ML	A-2, A-4, A-6, A-7	0-5	70-80	65-75	55-75	30-60	30-45	5-15
	31	Weathered bedrock.	---	---	---	---	---	---	---	---	---
120*:											
Coarsegold	0-7	Loam	ML	A-4	0-5	80-100	75-95	70-95	50-75	25-35	NP-5
	7-20	Loam, sandy clay loam, clay loam.	SM, ML	A-4, A-6, A-7	0-5	80-100	75-95	60-95	35-65	30-45	5-15
	20-31	Gravelly loam, gravelly clay loam, gravelly sandy clay loam.	SM, ML	A-2, A-4, A-6, A-7	0-5	70-80	65-75	55-75	30-60	30-45	5-15
	31	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
121, 122	0-22	Coarse sandy loam.	SM	A-2	0	90-100	75-95	40-65	25-35	20-30	NP-5
Crouch	22-43	Loam, sandy loam, coarse sandy loam.	SM	A-2, A-4	0	90-100	75-95	40-65	25-50	20-30	NP-5
	43-70	Loamy sand	SM, SP-SM	A-1, A-2	0	90-100	75-95	35-60	10-25	---	NP
	70	Weathered bedrock.	---	---	---	---	---	---	---	---	---
123*:											
Crouch	0-22	Coarse sandy loam.	SM	A-2	0	90-100	75-95	40-65	25-35	20-30	NP-5
	22-43	Loam, sandy loam, coarse sandy loam.	SM	A-2, A-4	0	90-100	75-95	40-65	25-50	20-30	NP-5
	43-70	Loamy sand	SM, SP-SM	A-1, A-2	0	90-100	75-95	35-60	10-25	---	NP
	70	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
124, 125----------	0-14	Loam----------	ML, CL-ML	A-4	0	95-100	85-100	70-95	50-60	15-30	NP-10
Exeter	14-30	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	95-100	85-100	70-90	35-65	25-40	10-20
	30-43	Indurated-------	---	---	---	---	---	---	---	---	---
	43-60	Sand, gravelly coarse sand.	SM, SP-SM	A-1	0	80-95	50-95	30-50	5-15	---	NP
126, 127, 128------	0-8	Sandy loam------	SM	A-4	0	95-100	90-100	60-75	35-50	15-25	NP-5
Fallbrook	8-51	Sandy clay loam, clay loam.	SC, CL	A-4, A-6	0	95-100	95-100	70-80	45-65	25-35	10-20
	51	Weathered bedrock.	---	---	---	---	---	---	---	---	---
129*:											
Fallbrook----------	0-8	Sandy loam------	SM	A-4	0	95-100	90-100	60-75	35-50	15-25	NP-5
	8-51	Sandy clay loam, clay loam.	SC, CL	A-4, A-6	0	95-100	95-100	70-80	45-65	25-35	10-20
	51	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
130*:											
Friant------------	0-7	Fine sandy loam	SM, SM-SC	A-4	0-10	90-100	85-100	60-70	35-50	20-30	NP-10
	7-18	Gravelly sandy loam, gravelly fine sandy loam, gravelly loam.	SM	A-1, A-2, A-4	0-10	90-100	65-75	40-60	20-40	15-25	NP-5
	18	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
131----------	0-14	Silt loam-------	ML	A-4	0	100	95-100	85-100	50-80	25-40	NP-10
Grangeville	14-64	Stratified loamy sand to silt loam.	SM	A-2, A-4	0	100	95-100	60-95	25-50	15-25	NP-5
132, 133----------	0-18	Sandy loam------	SM	A-2, A-4	0	95-100	75-100	50-75	20-50	10-25	NP-5
Greenfield	18-70	Fine sandy loam, sandy loam, coarse sandy loam.	SM	A-2, A-4	0	80-100	75-100	50-75	20-50	10-25	NP-5
134, 135----------	0-16	Loam----------	ML, CL-ML	A-4	0-5	80-100	75-100	65-95	50-75	20-30	NP-10
Havala	16-45	Sandy clay loam, clay loam.	SC, CL	A-6	0-5	80-100	75-100	70-95	35-60	25-40	10-20
	45-64	Sandy loam, fine sandy loam.	SM	A-2, A-4	0-5	80-100	75-100	50-70	25-40	20-30	NP-5
136, 137----------	0-29	Loam----------	ML, CL-ML	A-4	0	90-100	85-100	65-85	50-60	15-30	NP-10
Holland	29-64	Sandy clay loam, clay loam.	SC, CL	A-6	0	90-100	85-100	70-90	40-70	25-40	10-20
	64-80	Sandy loam, loam	SM, ML, SM-SC, CL-ML	A-4	0	90-100	85-100	60-85	35-60	15-30	NP-10
	80	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
138*:											
Holland	0-29	Loam	ML, CL-ML	A-4	0	90-100	85-100	65-85	50-60	15-30	NP-10
	29-64	Sandy clay loam, clay loam.	SC, CL	A-6	0	90-100	85-100	70-90	40-70	25-40	10-20
	64-80	Sandy loam, loam	SM, ML, SM-SC, CL-ML	A-4	0	90-100	85-100	60-85	35-60	15-30	NP-10
	80	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
139, 140	0-11	Sandy loam	SM	A-2, A-4	0	85-100	75-100	45-70	25-40	10-25	NP-5
Honcut	11-70	Coarse sandy loam, sandy loam.	SM	A-2, A-4	0	85-100	75-100	35-70	25-40	10-25	NP-5
141, 142, 143	0-9	Loam	CL, CL-ML	A-6, A-4	0-5	90-100	75-95	65-90	50-70	25-35	5-15
Las Posas	9-32	Clay loam, clay	CL, CH	A-7	0	90-100	75-95	70-90	60-85	40-60	20-35
	32	Weathered bedrock.	---	---	---	---	---	---	---	---	---
144*:											
Las Posas	0-9	Loam	CL, CL-ML	A-6, A-4	0-5	90-100	75-95	65-90	50-70	25-35	5-15
	9-32	Clay loam, clay	CL, CH	A-7	0	90-100	75-95	70-90	60-85	40-60	20-35
	32	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
145	0-6	Clay loam	CL	A-6, A-7	0	100	95-100	90-100	65-80	35-45	10-20
Lewis	6-29	Clay loam, clay	CH, CL	A-7	0	100	100	90-100	75-95	40-60	20-30
	29-38	Sandy clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	80-100	45-75	30-45	10-20
	38-52	Cemented	---	---	---	---	---	---	---	---	---
	52-60	Stratified sandy loam to clay loam.	CL-ML	A-4	0	100	95-100	60-90	50-60	20-30	5-10
146*. Pits											
147, 148, 149	0-32	Clay	CH, CL, MH	A-7	0-5	85-100	75-100	70-95	60-90	45-65	20-30
Porterville	32-72	Clay, sandy clay.	CH, CL	A-7	0	100	100	90-100	60-95	45-65	20-40
150	0-7	Cobbly clay	CH, CL	A-7	20-55	85-95	75-85	65-75	60-70	45-65	20-30
Porterville	7-69	Clay	CH, CL	A-7	0-10	95-100	90-100	80-100	65-95	45-65	20-30
151*. Riverwash											
152*. Rock outcrop											
153	0-29	Loam	SM-SC, SM, ML, CL-ML	A-4	0	95-100	90-100	75-90	35-60	15-30	NP-10
San Emigdio	29-66	Fine sandy loam, sandy loam, loam.	SM-SC, SM, ML, CL-ML	A-4	0	80-100	75-100	60-90	35-60	15-30	NP-10

See footnote at end of table.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
154, 155----------	0-13	Loam----------	CL-ML, ML	A-4	0	95-100	85-100	75-90	50-60	15-30	NP-10
San Joaquin	13-20	Sandy clay loam.	SC	A-6	0	95-100	85-100	70-90	35-50	30-40	10-20
	20-25	Clay loam, clay.	CL	A-7	0	95-100	85-100	80-95	55-70	40-50	25-35
	25-56	Indurated-------	---	---	---	---	---	---	---	---	---
	56-78	Stratified sandy loam to loam.	SM, SM-SC	A-2, A-4	0	90-100	85-100	60-75	30-50	10-25	NP-10
156, 157, 158------	0-9	Sandy loam------	SM	A-2, A-4	0	95-100	85-100	60-70	30-40	15-25	NP-5
Sesame	9-31	Sandy clay loam, loam.	CL	A-6	0	95-100	85-100	80-95	50-60	25-40	10-20
	31	Weathered bedrock.	---	---	---	---	---	---	---	---	---
159----------	0-38	Clay----------	CH, CL	A-7	0	100	95-100	90-100	75-95	40-60	20-35
Seville	38-52	Cemented--------	---	---	---	---	---	---	---	---	---
	52-62	Sandy loam, sandy clay loam, loam.	SM-SC, SC	A-4, A-6	0-5	90-100	85-95	50-85	35-60	20-35	5-15
160*:											
Sheephead---------	0-18	Coarse sandy loam.	SM	A-2, A-1	0-15	80-100	75-95	40-65	20-35	20-30	NP-5
	18	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
161, 162----------	0-8	Loam----------	ML	A-4	0-10	80-100	75-95	65-90	50-75	20-35	NP-10
Trabuco	8-12	Clay loam, gravelly clay loam.	CL, SC	A-6	0-10	75-100	60-95	50-90	40-75	30-40	10-20
	12-26	Clay, clay loam.	CL, CH	A-7	0-10	80-100	75-95	70-90	65-85	40-60	20-30
	26-42	Clay loam-------	CL	A-6	0-10	80-100	75-95	70-90	55-80	30-40	10-20
	42	Weathered bedrock.	---	---	---	---	---	---	---	---	---
163*:											
Trabuco----------	0-8	Loam----------	ML	A-4	0-10	80-100	75-95	65-90	50-75	20-35	NP-10
	8-12	Clay loam, gravelly clay loam.	CL, SC	A-6	0-10	75-100	60-95	50-90	40-75	30-40	10-20
	12-26	Clay, clay loam.	CL, CH	A-7	0-10	80-100	75-95	70-90	65-85	40-60	20-30
	26-42	Clay loam-------	CL	A-6	0-10	80-100	75-95	70-90	55-80	30-40	10-20
	42	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
164----------	0-16	Sand----------	SW-SM, SM, SP-SM	A-1, A-2, A-3	---	95-100	95-100	40-70	5-25	---	NP
Tujunga	16-60	Loamy sand, coarse sand, sand.	SW-SM, SM, SP-SM	A-1, A-2, A-3	---	95-100	95-100	40-70	5-25	---	NP
165, 166, 167------	0-27	Coarse sandy loam.	SM	A-2, A-1	0	90-100	80-95	45-65	20-35	---	NP
Vista	27	Weathered bedrock.	---	---	---	---	---	---	---	---	---
168*:											
Vista----------	0-27	Coarse sandy loam.	SM	A-2, A-1	0	90-100	80-100	45-65	20-35	---	NP
	27	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 13.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
169, 170---------- Walong	0-33 33	Sandy loam------ Weathered bedrock.	SM ---	A-2, A-4 ---	0-5 ---	95-100 ---	80-100 ---	55-70 ---	30-40 ---	20-30 ---	NP-5 ---
171*: Walong---------- Rock outcrop.	0-33 33	Sandy loam------ Weathered bedrock.	SM ---	A-2, A-4 ---	0-5 ---	95-100 ---	80-100 ---	55-70 ---	30-40 ---	20-30 ---	NP-5 ---
172, 173---------- Wyman	0-19 19-30 30-54 54-69 69-75	Loam---------- Clay loam, loam. Clay loam, silty clay loam. Sandy clay loam. Stratified sand to very gravelly sand.	ML, CL-ML CL CL SC GP-GM, SP-SM	A-4 A-6 A-6, A-7 A-6 A-1	0 0 0 0 0	80-100 80-100 80-100 80-100 50-85	75-100 75-100 75-100 75-100 40-80	65-95 70-95 60-100 60-80 30-50	50-80 55-75 55-85 35-50 5-10	20-30 25-40 35-45 30-40 ---	NP-10 10-20 15-20 10-20 NP
174---------- Wyman	0-16 16-40 40-60	Gravelly loam--- Gravelly sandy clay loam. Stratified very gravelly sand to sand.	SM, SM-SC, GM, GM-GC SC, GC GP-GM, SP-SM	A-4 A-2 A-1	0 0 0	65-90 65-90 50-85	55-75 55-75 40-80	50-75 45-65 30-50	35-50 25-35 5-10	20-30 30-40 ---	NP-10 10-20 NP
175*. Xerofluvents											
176, 177---------- Yettem	0-14 14-70	Sandy loam------ Sandy loam, coarse sandy loam, fine sandy loam.	SM SM	A-2 A-2, A-4	0 0	100 100	100 100	55-70 55-85	25-35 25-50	15-25 15-25	NP-5 NP-5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than. Entries under "Erosion factors--T" apply to the entire profile. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
100, 101, 102, 103----------	0-16	2.0-6.0	0.10-0.12	5.6-6.5	Low----------	0.24	3
Auberry	16-22	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.37	
	22-43	0.2-0.6	0.14-0.18	5.1-6.5	Moderate-------	0.37	
	43-56	2.0-6.0	0.09-0.12	5.1-7.3	Low----------	0.24	
	56	---	---	---	----------	---	
104*:							
Auberry----------	0-16	2.0-6.0	0.10-0.12	5.1-6.5	Low----------	0.24	3
	16-22	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.37	
	22-43	0.2-0.6	0.14-0.18	5.1-6.5	Moderate-------	0.37	
	43-56	2.0-6.0	0.09-0.12	5.1-7.3	Low----------	0.24	
	56	---	---	---	----------	---	
Rock outcrop.							
105, 106, 107----	0-7	2.0-6.0	0.10-0.12	6.1-7.3	Low----------	0.28	2
Blasingame	7-36	0.2-0.6	0.14-0.18	5.6-7.3	Moderate-------	0.37	
	36	---	---	---	----------	---	
108*:							
Blasingame------	0-7	2.0-6.0	0.10-0.12	6.1-7.3	Low----------	0.28	2
	7-36	0.2-0.6	0.14-0.18	5.6-7.3	Moderate-------	0.37	
	36	---	---	---	----------	---	
Rock outcrop.							
109, 110, 111, 112----------	0-30	0.06-0.2	0.12-0.15	6.1-8.4	High----------	0.20	2
Centerville	30-37	0.06-0.2	0.12-0.15	7.4-8.4	High----------	0.24	
	37	---	---	---	----------	---	
113, 114----------	0-19	0.06-0.2	0.10-0.15	6.1-8.4	High----------	0.20	2
Cibo	19-35	0.06-0.2	0.12-0.15	6.6-8.4	High----------	0.24	
	35	---	---	---	----------	---	
115*:							
Cibo----------	0-19	0.06-0.2	0.10-0.15	6.1-8.4	High----------	0.20	2
	19-35	0.06-0.2	0.12-0.15	6.6-8.4	High----------	0.24	
	35	---	---	---	----------	---	
Rock outcrop.							
116*:							
Cieneba----------	0-16	2.0-6.0	0.09-0.14	5.6-6.5	Low----------	0.24	1
	16	---	---	---	----------	---	
Rock outcrop.							
117----------	0-24	0.06-0.2	0.12-0.16	6.1-7.3	High----------	0.24	5
Clear Lake	24-66	0.06-0.2	0.12-0.16	7.4-8.4	High----------	0.24	
118, 119----------	0-7	0.6-2.0	0.13-0.16	6.1-7.3	Low----------	0.37	2
Coarsegold	7-20	0.2-0.6	0.14-0.18	6.1-7.3	Moderate-------	0.32	
	20-31	0.2-0.6	0.12-0.16	6.1-7.3	Moderate-------	0.28	
	31	---	---	---	----------	---	
120*:							
Coarsegold------	0-7	0.6-2.0	0.13-0.16	6.1-7.3	Low----------	0.37	2
	7-20	0.2-0.6	0.14-0.18	6.1-7.3	Moderate-------	0.32	
	20-31	0.2-0.6	0.12-0.16	6.1-7.3	Moderate-------	0.28	
	31	---	---	---	----------	---	
Rock outcrop.							

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
121, 122---	0-22	2.0-6.0	0.10-0.13	5.6-6.5	Low---	0.20	5
Crouch	22-43	2.0-6.0	0.10-0.14	5.6-6.5	Low---	0.20	
	43-70	2.0-6.0	0.06-0.08	5.6-6.5	Low---	0.17	
	70	---	---	---	---	---	
123*:							
Crouch---	0-22	2.0-6.0	0.10-0.13	5.6-6.5	Low---	0.20	5
	22-43	2.0-6.0	0.10-0.14	5.6-6.5	Low---	0.20	
	43-70	2.0-6.0	0.06-0.08	5.6-6.5	Low---	0.17	
	70	---	---	---	---	---	
Rock outcrop.							
124, 125---	0-14	0.6-2.0	0.14-0.16	6.1-7.3	Low---	0.28	2
Exeter	14-30	0.2-0.6	0.14-0.17	6.6-7.8	Moderate---	0.37	
	30-43	---	---	---	---	---	
	43-60	2.0-6.0	0.03-0.08	7.4-8.4	Low---	0.43	
126, 127, 128---	0-8	2.0-6.0	0.10-0.13	6.1-7.3	Low---	0.28	3
Fallbrook	8-51	0.2-0.6	0.14-0.18	6.1-7.3	Moderate---	0.32	
	51	---	---	---	---	---	
129*:							
Fallbrook---	0-8	2.0-6.0	0.10-0.13	6.1-7.3	Low---	0.28	3
	8-51	0.2-0.6	0.14-0.18	6.1-7.3	Moderate---	0.32	
	51	---	---	---	---	---	
Rock outcrop.							
130*:							
Friant---	0-7	2.0-6.0	0.10-0.13	5.6-7.3	Low---	0.32	1
	7-18	2.0-6.0	0.08-0.10	5.6-7.3	Low---	0.28	
	18	---	---	---	---	---	
Rock outcrop.							
131---	0-14	0.6-2.0	0.15-0.17	7.4-8.4	Low---	0.37	5
Grangeville	14-64	2.0-6.0	0.13-0.15	6.6-8.4	Low---	0.32	
132, 133---	0-18	2.0-6.0	0.10-0.15	6.1-7.3	Low---	0.24	5
Greenfield	18-70	2.0-6.0	0.11-0.16	6.1-7.8	Low---	0.24	
134, 135---	0-16	0.6-2.0	0.12-0.16	6.1-7.3	Low---	0.32	5
Havala	16-45	0.2-0.6	0.15-0.18	6.6-7.3	Moderate---	0.32	
	45-64	2.0-6.0	0.09-0.13	6.6-8.4	Low---	0.20	
136, 137---	0-29	0.6-2.0	0.14-0.16	5.6-6.5	Low---	0.28	5
Holland	29-64	0.2-0.6	0.14-0.18	5.1-6.0	Moderate---	0.24	
	64-80	0.6-2.0	0.10-0.16	5.1-6.0	Low---	0.32	
	80	---	---	---	---	---	
138*:							
Holland---	0-29	0.6-2.0	0.14-0.16	5.6-6.5	Low---	0.28	5
	29-64	0.2-0.6	0.14-0.18	5.1-6.0	Moderate---	0.24	
	64-80	0.6-2.0	0.10-0.16	5.1-6.0	Low---	0.32	
	80	---	---	---	---	---	
Rock outcrop.							
139, 140---	0-11	2.0-6.0	0.10-0.13	6.1-7.3	Low---	0.28	5
Honcut	11-70	2.0-6.0	0.10-0.13	6.6-7.8	Low---	0.28	
141, 142, 143---	0-9	0.6-2.0	0.13-0.17	6.1-7.3	Moderate---	0.32	2
Las Posas	9-32	0.06-0.2	0.12-0.17	6.6-7.8	High---	0.24	
	32	---	---	---	---	---	

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
144*:							
Las Posas	0-9	0.6-2.0	0.13-0.17	6.1-7.3	Moderate	0.32	2
	9-32	0.06-0.2	0.12-0.17	6.6-7.8	High	0.24	
	32	---	---	---	---	---	
Rock outcrop.							
145	0-6	0.2-0.6	0.15-0.18	7.9-9.0	Moderate	0.49	2
Lewis	6-29	<0.06	0.06-0.13	>8.4	High	0.32	
	29-38	0.2-0.60	0.14-0.18	>8.4	Moderate	0.43	
	38-52	---	---	---	---	---	
	52-60	0.2-0.6	0.06-0.09	>8.4	Moderate	0.32	
146*. Pits							
147, 148, 149	0-32	0.06-0.2	0.10-0.15	6.6-8.4	High	0.28	5
Porterville	32-72	0.06-0.2	0.12-0.15	6.6-8.4	High	0.28	
150	0-7	0.06-0.2	0.08-0.11	6.6-8.4	High	0.17	5
Porterville	7-69	0.06-0.2	0.11-0.14	6.6-8.4	High	0.28	
151*. Riverwash							
152*. Rock outcrop							
153	0-29	2.0-6.0	0.10-0.16	7.4-8.4	Low	0.32	5
San Emigdio	29-66	2.0-6.0	0.10-0.16	7.4-8.4	Low	0.32	
154, 155	0-13	0.6-2.0	0.14-0.16	6.6-7.8	Low	0.37	2
San Joaquin	13-20	0.2-0.6	0.16-0.17	6.6-8.4	Low	0.28	
	20-25	<0.06	0.12-0.16	6.6-8.4	High	0.24	
	25-56	---	---	---	---	---	
	56-78	0.06-0.2	0.10-0.12	6.6-8.4	Low	0.32	
156, 157, 158	0-9	2.0-6.0	0.10-0.13	6.1-7.3	Low	0.28	2
Sesame	9-31	0.6-2.0	0.15-0.18	6.1-7.3	Moderate	0.17	
	31	---	---	---	---	---	
159	0-38	0.06-0.2	0.14-0.17	6.6-8.4	High	0.20	2
Seville	38-52	---	---	---	---	---	
	52-62	0.2-0.6	0.09-0.12	7.4-8.4	Moderate	0.28	
160*:							
Sheephead	0-18	2.0-6.0	0.07-0.12	6.1-6.5	Low	0.20	1
	18	---	---	---	---	---	
Rock outcrop.							
161, 162	0-8	0.6-2.0	0.13-0.16	6.1-7.3	Low	0.37	3
Trabuco	8-12	0.2-0.6	0.13-0.18	6.1-7.3	Moderate	0.32	
	12-26	0.06-0.2	0.12-0.16	6.1-7.3	High	0.28	
	26-42	0.2-0.6	0.16-0.18	6.1-7.3	Moderate	0.32	
	42	---	---	---	---	---	
163*:							
Trabuco	0-8	0.6-2.0	0.13-0.16	6.1-7.3	Low	0.37	3
	8-12	0.2-0.6	0.13-0.18	6.1-7.3	Moderate	0.32	
	12-26	0.06-0.2	0.12-0.16	6.1-7.3	High	0.28	
	26-42	0.2-0.6	0.16-0.18	6.1-7.3	Moderate	0.32	
	42	---	---	---	---	---	
Rock outcrop.							
164	0-16	6.0-20	0.05-0.08	6.6-7.3	Low	0.17	5
Tujunga	16-60	6.0-20	0.05-0.08	6.6-7.3	Low	0.20	

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
165, 166, 167----	0-27	2.0-6.0	0.07-0.12	6.1-7.3	Low----------	0.28	2
Vista	27	---	---	---	----------	---	
168*:							
Vista----------	0-27	2.0-6.0	0.07-0.12	6.1-7.3	Low----------	0.28	2
	27	---	---	---	----------	---	
Rock outcrop.							
169, 170---------	0-33	2.0-6.0	0.09-0.11	6.6-7.8	Low----------	0.20	2
Walong	33	---	---	---	----------	---	
171*:							
Walong----------	0-33	2.0-6.0	0.09-0.11	6.6-7.8	Low----------	0.20	2
	33	---	---	---	----------	---	
Rock outcrop.							
172, 173---------	0-19	0.6-2.0	0.14-0.17	6.1-7.3	Low----------	0.43	5
Wyman	19-30	0.6-2.0	0.14-0.17	6.1-7.8	Moderate-------	0.32	
	30-54	0.2-0.6	0.17-0.19	6.6-7.8	Moderate-------	0.43	
	54-69	0.2-0.6	0.16-0.18	6.6-7.8	Moderate-------	0.24	
	69-75	6.0-20	0.03-0.06	6.6-7.8	Low----------	0.15	
174----------	0-16	0.6-2.0	0.10-0.15	6.1-7.3	Low----------	0.37	5
Wyman	16-40	0.2-0.6	0.10-0.15	6.6-7.8	Moderate-------	0.20	
	40-60	6.0-20	0.03-0.06	6.6-7.8	Low----------	0.15	
175*.							
Xerofluvents							
176, 177---------	0-14	2.0-6.0	0.09-0.11	5.6-7.8	Low----------	0.24	5
Yettem	14-70	2.0-6.0	0.09-0.13	6.6-8.4	Low----------	0.24	

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--SOIL AND WATER FEATURES

[The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Bedrock		Cemented pan		Risk of corrosion	
		Depth	Hardness	Depth	Hardness	Uncoated steel	Concrete
		In					
100, 101, 102, 103--- Auberry	B	40-60	Rippable	---	---	Moderate	Moderate.
104*: Auberry	B	40-60	Rippable	---	---	Moderate	Moderate.
Rock outcrop.							
105, 106, 107--- Blasingame	C	20-40	Rippable	---	---	Moderate	Moderate.
108*: Blasingame	C	20-40	Rippable	---	---	Moderate	Moderate.
Rock outcrop.							
109, 110, 111, 112--- Centerville	D	20-40	Rippable	---	---	High	Low.
113, 114--- Cibo	D	20-40	Hard	---	---	High	Low.
115*: Cibo	D	20-40	Hard	---	---	High	Low.
Rock outcrop.							
116*: Cieneba	C	10-20	Rippable	---	---	Low	Low.
Rock outcrop.							
117--- Clear Lake	D	>60	---	---	---	High	High.
118, 119--- Coarsegold	C	20-40	Rippable	---	---	Moderate	Moderate.
120*: Coarsegold	C	20-40	Rippable	---	---	Moderate	Moderate.
Rock outcrop.							
121, 122--- Crouch	B	40-80	Rippable	---	---	Moderate	Moderate.
123*: Crouch	B	40-80	Rippable	---	---	Moderate	Moderate.
Rock outcrop.							
124, 125--- Exeter	C	>60	---	20-40	Rippable	High	Low.
126, 127, 128--- Fallbrook	B	40-60	Rippable	---	---	Moderate	Moderate.
129*: Fallbrook	B	40-60	Rippable	---	---	Moderate	Moderate.
Rock outcrop.							

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Bedrock		Cemented pan		Risk of corrosion	
		Depth	Hardness	Depth	Hardness	Uncoated steel	Concrete
		In					
130*: Friant	D	10-20	Rippable	---	---	Moderate	Moderate.
Rock outcrop.							
131--- Grangeville	B	>60	---	---	---	High	Low.
132, 133--- Greenfield	B	>60	---	---	---	High	Low.
134, 135--- Havala	B	>60	---	---	---	High	Low.
136, 137--- Holland	B	>60	---	---	---	Moderate	Moderate.
138*: Holland	B	>60	---	---	---	Moderate	Moderate.
Rock outcrop.							
139, 140--- Honcut	B	>60	---	---	---	High	Low.
141, 142, 143--- Las Posas	C	20-40	Rippable	---	---	High	Low.
144*: Las Posas	C	20-40	Rippable	---	---	High	Low.
Rock outcrop.							
145--- Lewis	D	>60	---	20-40	Rippable	High	High.
146*. Pits							
147, 148, 149, 150--- Porterville	D	>60	---	---	---	High	Low.
151*. Riverwash							
152*. Rock outcrop							
153--- San Emigdio	B	>60	---	---	---	High	Low.
154, 155--- San Joaquin	D	>60	---	20-40	Rippable	High	Moderate.
156, 157, 158--- Sesame	C	20-40	Rippable	---	---	Moderate	Low.
159--- Seville	D	>60	---	20-40	Rippable	High	Low.
160*: Sheephead	C	10-20	Rippable	---	---	Low	Moderate.
Rock outcrop.							
161, 162--- Trabuco	C	40-60	Rippable	---	---	High	Moderate.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Bedrock		Cemented pan		Risk of corrosion	
		Depth	Hardness	Depth	Hardness	Uncoated steel	Concrete
		In					
163*: Trabuco	C	40-60	Rippable	---	---	High	Moderate.
Rock outcrop.							
164 Tujunga	A	>60	---	---	---	Low	Low.
165, 166, 167 Vista	C	20-40	Rippable	---	---	Moderate	Moderate.
168*: Vista	C	20-40	Rippable	---	---	Moderate	Moderate.
Rock outcrop.							
169, 170 Walong	B	20-40	Rippable	---	---	Moderate	Low.
171*: Walong	B	20-40	Rippable	---	---	Moderate	Low.
Rock outcrop.							
172, 173, 174 Wyman	B	60	---	---	---	High	Low.
175*. Xerofluvents							
176, 177 Yettem	B	>60	---	---	---	High	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Auberry	Fine-loamy, mixed, thermic Ultic Haploxeralfs
Blasingame	Fine-loamy, mixed, thermic Typic Haploxeralfs
Centerville	Fine, montmorillonitic, thermic Typic Chromoxererts
Cibo	Fine, montmorillonitic, thermic Typic Chromoxererts
Cieneba	Loamy, mixed, nonacid, thermic, shallow Typic Xerorthents
Clear Lake	Fine, montmorillonitic, thermic Typic Pelloxererts
Coarsegold	Fine-loamy, mixed, thermic Mollic Haploxeralfs
Crouch	Coarse-loamy, mixed, mesic Ultic Haploxerolls
Exeter	Fine-loamy, mixed, thermic Typic Durixeralfs
Fallbrook	Fine-loamy, mixed, thermic Typic Haploxeralfs
Friant	Loamy, mixed, thermic Lithic Haploxerolls
Grangeville	Coarse-loamy, mixed, thermic Fluvaquentic Haploxerolls
Greenfield	Coarse-loamy, mixed, thermic Typic Haploxeralfs
Havala	Fine-loamy, mixed, thermic Pachic Argixerolls
Holland	Fine-loamy, mixed, mesic Ultic Haploxeralfs
Honcut	Coarse-loamy, mixed, nonacid, thermic Typic Xerorthents
Las Posas	Fine, montmorillonitic, thermic Typic Rhodoxeralfs
Lewis	Fine, montmorillonitic, thermic Natric Durixeralfs
Porterville	Fine, montmorillonitic, thermic Typic Chromoxererts
San Emigdio	Coarse-loamy, mixed (calcareous), thermic Typic Xerofluvents
*San Joaquin	Fine, mixed, thermic Abruptic Durixeralfs
Sesame	Fine-loamy, mixed, thermic Typic Haploxeralfs
Seville	Fine, montmorillonitic, thermic Typic Chromoxererts
Sheephead	Loamy, mixed, mesic, shallow Entic Ultic Haploxerolls
Trabuco	Fine, mixed, thermic Mollic Haploxeralfs
Tujunga	Mixed, thermic Typic Xeropsamments
Vista	Coarse-loamy, mixed, thermic Typic Xerochrepts
Walong	Coarse-loamy, mixed, thermic Typic Haploxerolls
Wyman	Fine-loamy, mixed, thermic Typic Haploxeralfs
Xerofluvents	Thermic Xerofluvents
Yettem	Coarse-loamy, mixed, thermic Entic Haploxerolls

* U S GOVERNMENT PRINTING OFFICE 1982 -323-604/1095

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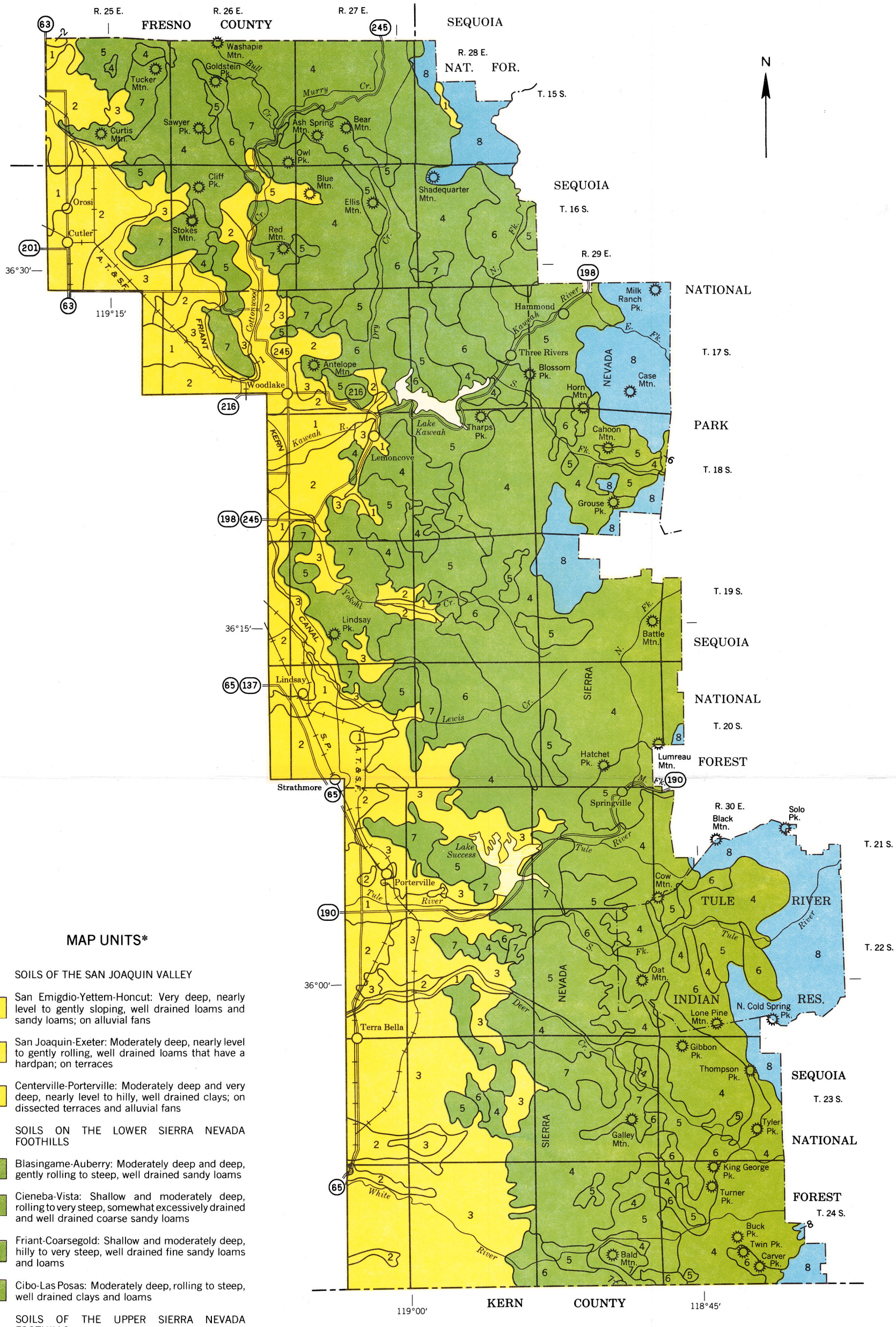


MAP UNITS*

SOILS OF THE SAN JOAQUIN VALLEY

1 — San Emigdio-Yettem-Honcut: Very deep, nearly level to gently sloping, well drained loams and sandy loams; on alluvial fans

2 — San Joaquin-Exeter: Moderately deep, nearly level to gently rolling, well drained loams that have a hardpan; on terraces

3 — Centerville-Porterville: Moderately deep and very deep, nearly level to hilly, well drained clays; on dissected terraces and alluvial fans

SOILS ON THE LOWER SIERRA NEVADA FOOTHILLS

4 — Blasingame-Auberry: Moderately deep and deep, gently rolling to steep, well drained sandy loams

5 — Cieneba-Vista: Shallow and moderately deep, rolling to very steep, somewhat excessively drained and well drained coarse sandy loams

6 — Friant-Coarsegold: Shallow and moderately deep, hilly to very steep, well drained fine sandy loams and loams

7 — Cibo-Las Posas: Moderately deep, rolling to steep, well drained clays and loams

SOILS OF THE UPPER SIERRA NEVADA FOOTHILLS

8 — Holland-Crouch-Sheephead: Very deep, deep, and shallow, hilly to very steep, well drained and somewhat excessively drained loams and coarse sandy loams

***The terms for texture used in the descriptive heading apply to the surface layer of the major soils**

Compiled 1979

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

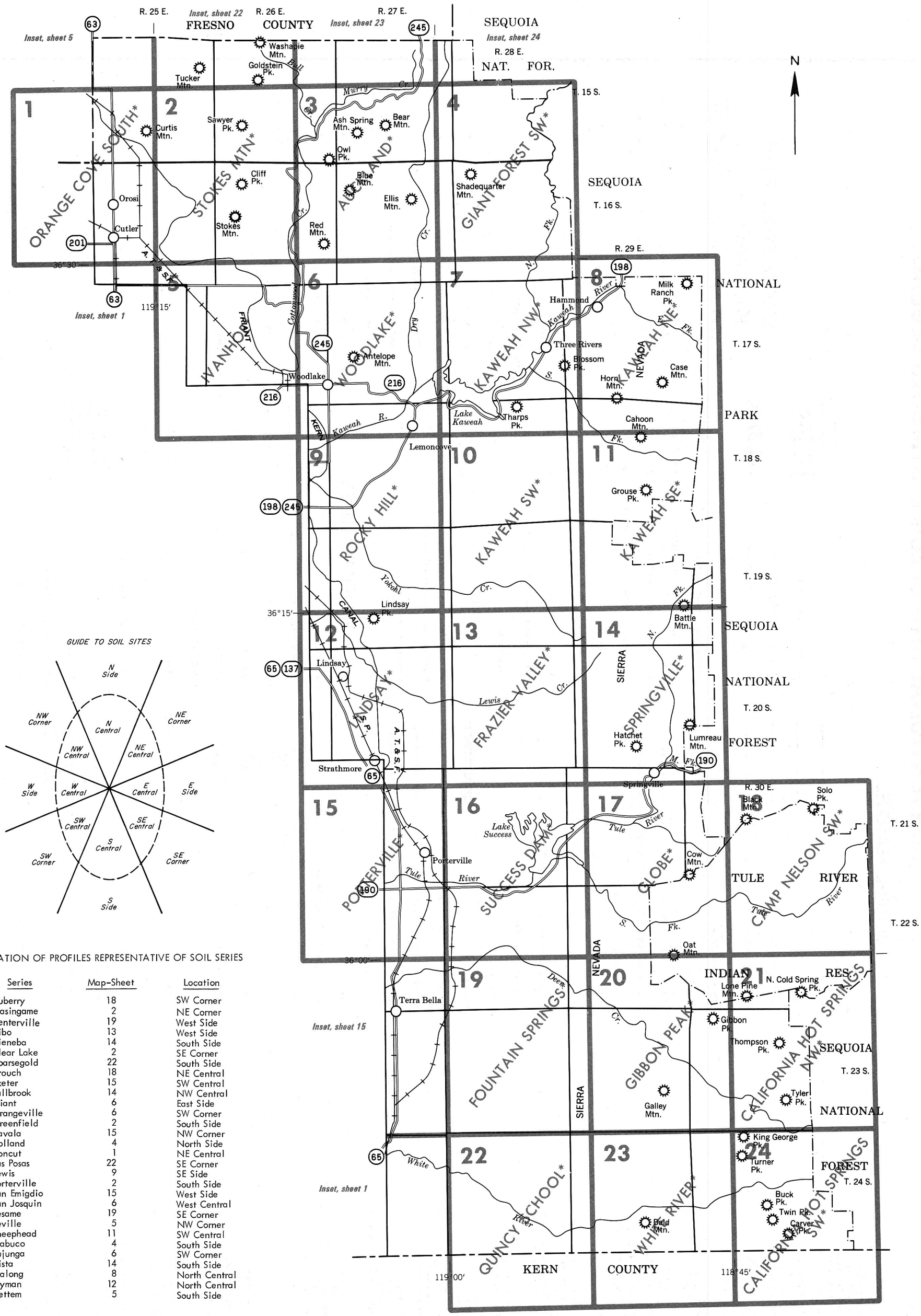
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS
UNIVERSITY OF CALIFORNIA AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

TULARE COUNTY, CALIFORNIA, CENTRAL PART

Scale 1: 316,800

1 0 1 2 3 4 5 Miles



GUIDE TO SOIL SITES

LOCATION OF PROFILES REPRESENTATIVE OF SOIL SERIES

Series	Map-Sheet	Location
Auberry	18	SW Corner
Blasingame	2	NE Corner
Centerville	19	West Side
Cibo	13	West Side
Cieneba	14	South Side
Clear Lake	2	SE Corner
Coarsegold	22	South Side
Crouch	18	NE Central
Exeter	15	SW Central
Fallbrook	14	NW Central
Friant	6	East Side
Grangeville	6	SW Corner
Greenfield	2	South Side
Havala	15	NW Corner
Holland	4	North Side
Honcut	1	NE Central
Las Posas	22	SE Corner
Lewis	9	SE Side
Porterville	2	South Side
San Emigdio	15	West Side
San Josquin	6	West Central
Sesame	19	SE Corner
Seville	5	NW Corner
Sheephead	11	SW Central
Trabuco	4	South Side
Tujunga	6	SW Corner
Vista	14	South Side
Walong	8	North Central
Wyman	12	North Central
Yettem	5	South Side

*QUADRANGLE NAME

INDEX TO MAP SHEETS

TULARE COUNTY, CALIFORNIA, CENTRAL PART

Scale 1: 316,800

1 0 1 2 3 4 5 Miles

SOIL LEGEND

SYMBOL	NAME
100	Auberry sandy loam, 5 to 9 percent slopes
101	Auberry sandy loam, 9 to 15 percent slopes
102	Auberry sandy loam, 15 to 30 percent slopes
103	Auberry sandy loam, 30 to 50 percent slopes
104	Auberry-Rock outcrop complex, 9 to 50 percent slopes
105	Blasingame sandy loam, 9 to 15 percent slopes
106	Blasingame sandy loam, 15 to 30 percent slopes
107	Blasingame sandy loam, 30 to 50 percent slopes
108	Blasingame-Rock outcrop complex, 9 to 50 percent slopes
109	Centerville clay, 0 to 2 percent slopes
110	Centerville clay, 2 to 9 percent slopes
111	Centerville clay, 9 to 15 percent slopes
112	Centerville clay, 15 to 30 percent slopes
113	Cibo clay, 15 to 30 percent slopes
114	Cibo clay, 30 to 50 percent slopes
115	Cibo-Rock outcrop complex, 15 to 50 percent slopes
116	Cieneba-Rock outcrop complex, 15 to 75 percent slopes
117	Clear Lake clay, drained
118	Coarsegold loam, 15 to 30 percent slopes
119	Coarsegold loam, 30 to 50 percent slopes
120	Coarsegold-Rock outcrop complex, 15 to 50 percent slopes
121	Crouch coarse sandy loam, 15 to 30 percent slopes
122	Crouch coarse sandy loam, 30 to 50 percent slopes
123	Crouch-Rock outcrop complex, 15 to 50 percent slopes
124	Exeter loam, 0 to 2 percent slopes
125	Exeter loam, 2 to 9 percent slopes
126	Fallbrook sandy loam, 9 to 15 percent slopes
127	Fallbrook sandy loam, 15 to 30 percent slopes
128	Fallbrook sandy loam, 30 to 50 percent slopes
129	Fallbrook-Rock outcrop complex, 9 to 50 percent slopes
130	Friant-Rock outcrop complex, 15 to 75 percent slopes
131	Grangeville silt loam, drained
132	Greenfield sandy loam, 0 to 2 percent slopes
133	Greenfield sandy loam, 2 to 5 percent slopes
134	Havala loam, 0 to 2 percent slopes
135	Havala loam, 2 to 5 percent slopes
136	Holland loam, 15 to 30 percent slopes
137	Holland loam, 30 to 50 percent slopes
138	Holland-Rock outcrop complex, 15 to 50 percent slopes
139	Honcut sandy loam, 0 to 2 percent slopes
140	Honcut sandy loam, 2 to 5 percent slopes
141	Las Posas loam, 9 to 15 percent slopes
142	Las Posas loam, 15 to 30 percent slopes
143	Las Posas loam, 30 to 50 percent slopes
144	Las Posas-Rock outcrop complex, 9 to 50 percent slopes
145	Lewis clay loam
146	Pits
147	Porterville clay, 0 to 2 percent slopes
148	Porterville clay, 2 to 9 percent slopes
149	Porterville clay, 9 to 15 percent slopes
150	Porterville cobbly clay, 2 to 15 percent slopes
151	Riverwash
152	Rock outcrop
153	San Emigdio loam
154	San Jaoquin loam, 0 to 2 percent slopes
155	San Joaquin loam, 2 to 9 percent slopes
156	Sesame sandy loam, 9 to 15 percent slopes
157	Sesame sandy loam, 15 to 30 percent slopes
158	Sesame sandy loam, 30 to 50 percent slopes
159	Seville clay
160	Sheephead-Rock outcrop complex, 15 to 75 percent slopes
161	Trabuco loam, 15 to 30 percent slopes
162	Trabuco loam, 30 to 50 percent slopes
163	Trabuco-Rock outcrop complex, 15 to 50 percent slopes
164	Tujunga sand
165	Vista coarse sandy loam, 9 to 15 percent slopes
166	Vista coarse sandy loam, 15 to 30 percent slopes
167	Vista coarse sandy loam, 30 to 50 percent slopes
168	Vista-Rock outcrop complex, 9 to 50 percent slopes
169	Walong sandy loam, 15 to 30 percent slopes
170	Walong sandy loam, 30 to 50 percent slopes
171	Walong-Rock outcrop complex, 15 to 50 percent slopes
172	Wyman loam, 0 to 2 percent slopes
173	Wyman loam, 2 to 5 percent slopes
174	Wyman gravelly loam, 0 to 2 percent slopes
175	Xerofluvents, flooded
176	Yettem sandy loam, 0 to 2 percent slopes
177	Yettem sandy loam, 2 to 5 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National
- State
- County, parish, municipo
- Reservation, national or state
- Small park, cemetery, airfield, airport, floodpool, etc — Davis Airstrip; Cem; FLOOD POOL LINE
- Land grant
- Limit of soil survey (labeled)
- TOWNSHIP OR RANGE LINE, U.S. LAND SURVEY
- SECTION LINE, U.S. LAND SURVEY
- TOWNSHIP LINE, NOT U. S. LAND SURVEY
- SECTION LINE, NOT U.S. LAND SURVEY
- SECTION CORNER: Found - Indicated
- BOUNDARY MONUMENT

ROADS

- Divided, hard surface
- Primary highway, hard surface
- Secondary highway, hard surface
- Light-duty road, hard or improved surface
- Unimproved road
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate — 70
- Federal — 410
- State — 52
- County, farm or ranch — 378

RAILROADS

- Single track
- Multiple track

LEVEES

- Without road
- With road
- With railroad

- POWER TRANSMISSION LINE
- LANDMARK LINE (labeled as to type) — TELEPHONE
- OVERPASS - UNDERPASS

DAMS

- Large dam
- Small dam: masonry - earth — w; water

MISCELLANEOUS MAP FEATURES

- Buildings (dwelling, farmstead, etc.)
- School - Church
- Buildings (barn, warehouse, etc.)
- Tanks: oil, water (labeled only if water) — Water Tank
- Wells other than water (labeled as to type) — Oil; Gas
- U.S. mineral or location monument - Prospect
- Quarry - Gravel Pit
- Mine shaft - Tunnel or cave entrance
- Campsite - Picnic area
- Located or landmark object - Windmill
- Foreshore flat
- Horizontal control station — △
- Vertical control station — BM × 671 × 672
- Road fork - Section corner with elevation — 429; 58
- Checked spot elevation — × 5970

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end

CANALS OR DITCHES

- Double line — CANAL
- Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — w; water
- Intermittent — int; intermittent

MISCELLANEOUS WATER FEATURES

- Land subject to controlled inundation
- Marsh or swamp
- Aqueduct tunnel

- Spring
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

- SOIL DELINEATIONS AND SYMBOLS — 102; 108
- ESCARPMENTS
  - Bedrock (points down slope)
  - Other than bedrock (points down slope)
- SHORT STEEP SLOPE
- GULLY
- DEPRESSION OR SINK
- SOIL SAMPLE SITE — S
- MISCELLANEOUS
  - Blowout
  - Clay spot
  - Gravelly spot
  - Gumbo, slick or scabby spot (sodic)
  - Dumps and other similar non soil areas
  - Prominent hill or peak
  - Saline spot
  - Severely eroded spot
  - Slide or slip (tips point up slope)
  - Stony spot - Very stony spot — 0
  - Rock outcrop — v
  - Gaging station

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 1
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(ORANGE COVE SOUTH QUADRANGLE AND PARTS OF RICHGROVE AND MONSON QUADRANGLES)

INSET A

INSET B

This soil survey was compiled in 1979 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1976 and 1977 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

Scale 1:24000

TULARE COUNTY, CALIFORNIA, CENTRAL PART NO. 1

SHEET NO. 1 OF 24

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 2
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(STOKES MTN. QUADRANGLE)

1 930 000 FEET — R. 25 E. | R. 26 E. — (Joins inset, sheet 22) — 119°07'30" — 36°37'30"

460 000 FEET

T. 15 S. — T. 16 S.

(Joins sheet 1)

(Joins sheet 3)

430 000 FEET

36°30' — 119°15'

R. 25 E. | R. 26 E. — (Joins sheet 5)

1 960 000 FEET

This soil survey was compiled in 1979 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1976 and 1977 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.


1 970 000 FEET
R. 26 E. | R. 27 E.
(Joins inset, sheet 23)
119°00′
36°37′30″
Stickrock Canyon
Bull Creek
Murry Creek
Indian Creek
Persian Creek
Dudley Ranch
Goat Hill
Murry Gulch
Springs
Badger Creek
Dry Valley
M-Bar-J Ranch
Pippin Flat
Shadley
Bear Mountain
Ash Spring Mtn
Buckeye Creek
Auckland
Auckland Ranch
Cottonwood
Rattlesnake Cr.
Coyote Flat
Buzzard Roost
Bear Flat
Brown Flat
Warm Sulfur Spring
Pacific Coast Equestrian Research Farm
Cold Sulfur Spring
Lucy Runyon Canyon
Bill Moore Canyon
Bill Moore Ridge
Rancheria Canyon
Rancheria Flat
460 000 FEET
T. 15 S.
T. 16 S.
Owl Peak
Grapevine Creek
Grapevine Peak
Morgan Canyon
Sugarloaf
Double Trough Spring
(Joins sheet 2)
(Joins sheet 4)
Chimney Spring
Blue Mountain
Rock Spring
Adams Flat
Buck Canyon
Marble Canyon
Ellis Mountain
Cedar Creek
Lion Canyon
Lucky Canyon
Clark Canyon
Green Spring
Blue Canyon
Francis Flat
Adams Gap
Bear Creek
Murry Flat
Collier Creek
Collier Cove
Robie Lomas Ranch
House Spring
Schoolhouse Spring
Dudley Spring
McClure Flat
McClure Spring
Coon Spring
LONG MOUNTAIN
Mitchell Canyon
Ellis Place
Becketts Backbone
Wagonshed Creek
Quail Flat
Indian Spring
430 000 FEET
Red Mountain
Indian Painting Spring
Rattlesnake Spring
Antelope Creek
Ridenhour Creek
Minnehaha Creek
36°30′
119°07′30″
R. 26 E. | R. 27 E.
(Joins sheet 6)
2 000 000 FEET

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

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Orthophotobase compiled from 1976 and 1977 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

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SOIL CONSERVATION SERVICE

SHEET NO. 4
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(GIANT FOREST S.W. QUADRANGLE)

1 960 000 FEET | R. 27 E. | R. 28 E. | (Joins inset, sheet 24) | R. 28 E. | 118°52'30" | 36°37'30"

470 000 FEET

T. 15 S. — T. 16 S.

(Joins sheet 3)

430 000 FEET

36°30' | 119°00' | R. 27 E. | R. 28 E. | (Joins sheet 7) | 1 990 000 FEET | R. 28 E. | R. 29 E.

Dry Valley
Eshom Valley
Tarbell Pocket
Tunnels
Tunnel
Fox Flat
Live Oak Pass
Shadequarter Mountain
Pattee Rocks
Burnt Point
Sheep Ridge
Cedar Creek
Lion Canyon
Lucky Canyon
Clark Canyon
Backbone
Beckettes
Dry Creek
East Fork
Live Oak
Advance
JEEP TRAIL
SEQUOIA NATIONAL FOREST
LIMIT OF SOIL SURVEY
SEQUOIA NATIONAL PARK
NORTH FORK KAWEAH RIVER

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10 000 Feet
Scale 1:24000

Orthophotobase compiled from 1976 and 1977 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 5
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(IVANHOE QUADRANGLE AND PART OF ORANGE COVE NORTH QUADRANGLE)

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Orthophotobase compiled from 1976 and 1977 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

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SOIL CONSERVATION SERVICE

SHEET NO. 6
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(WOODLAKE QUADRANGLE)

1 970 000 FEET | R. 26 E. | R. 27 E. | (Joins sheet 3) | 119°00′ | 36°30′

T. 16 S. — T. 17 S.

(Joins sheet 5) | (Joins sheet 7)

T. 17 S. — T. 18 S.

380 000 FEET | 410 000 FEET | 2 000 000 FEET

36°22′30″ | 119°07′30″ | R. 26 E. | R. 27 E. | (Joins sheet 9)

Minnehaha Ranch
Minnehaha Creek
Buckeye Flat
Long Mtn
Homer Cove
Hog Spring Canyon
Hambright Canyon
Oat Knob
Oat Knob Canyon
General Canyon
Fridley Canyon
Indian Canyon
Homer Ranch
Davis Mountain
Liveoak Canyon
Bequette Canyon
Elderwood Sta
Vanderhoof Ranch
Antelope Creek
Cottonwood Road
Elderwood
Lone Oak Mtn
Rose Street
Sentinel Butte
ANTELOPE VALLEY
Davis Ranch
McKee Canyon
Ragle Canyon
Sequoia
Antelope Mountain
Arrastre Canyon
Castle Rock
Union High Sch
Woodlake
Woodlake Junction
Antelope Cem
Landing Strip
BRAVO LAKE
Naranjo
Steve Barton Point
Gaging Sta
Terminus Dam
water
Terminus (Site)
Gravel Pit
Limekiln Hill
LAKE KAWEAH
RIVER
DITCH
ELECTRIC
VISALIA
WUTCHUMNA
ST JOHNS
KERN CANAL
FOOTHILL
LEMONCOVE
LIMIT OF SOIL SURVEY
McKays Pt
Wutchumna Hill
Lemoncove
Citro
Goodale
Oil Tank
Sequoia Union Sch

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 Scale 1:24000 5000 10000 Feet

Orthophotobase compiled from 1976 and 1977 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

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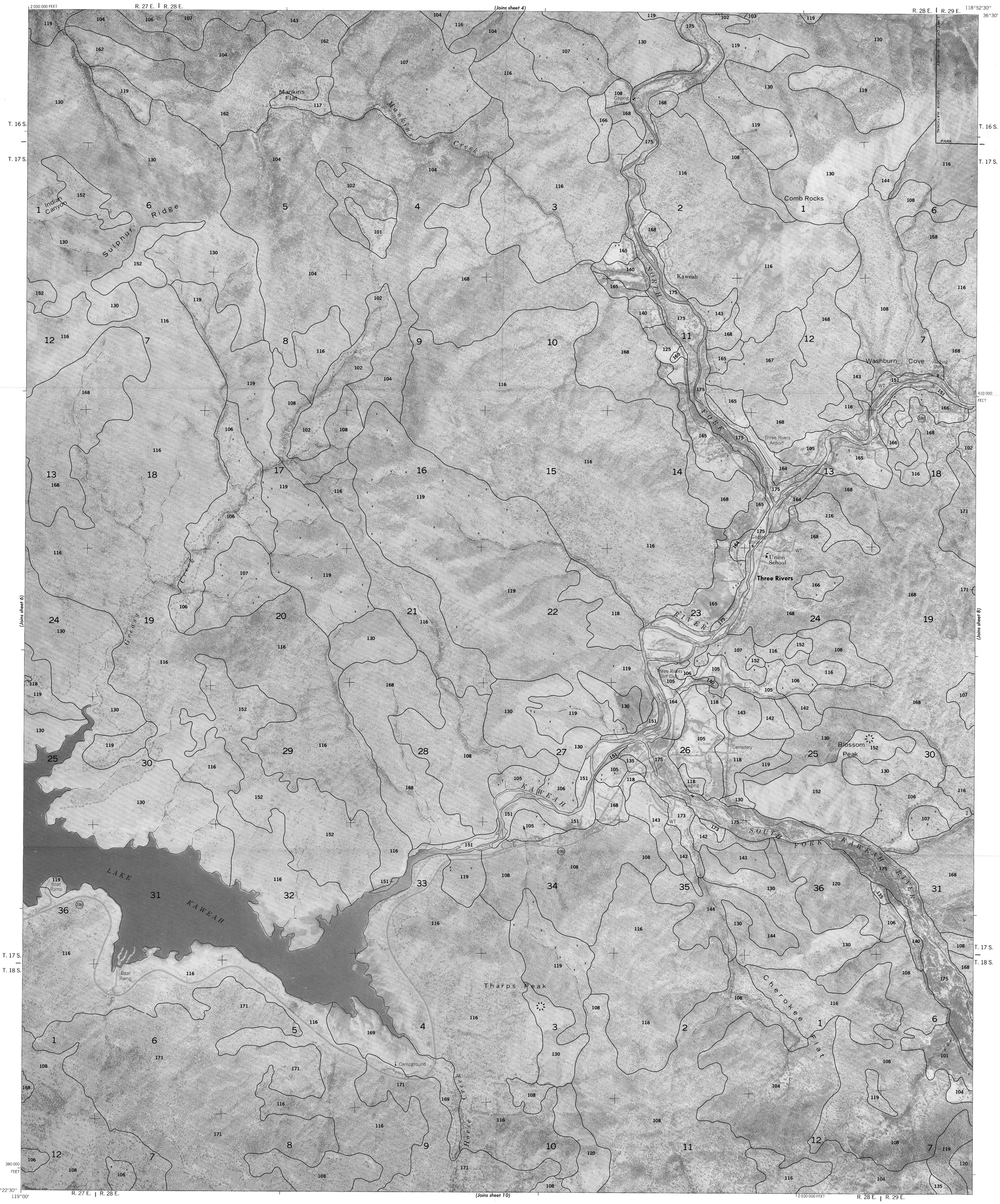
SHEET NO. 7
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(KAWEAH N.W. QUADRANGLE)



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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

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Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

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SHEET NO. 8
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(KAWEAH N.E. QUADRANGLE)

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Scale 1:24000

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SHEET NO. 9
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(ROCKY HILL QUADRANGLE)

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

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U. S. DEPARTMENT OF AGRICULTURE
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SHEET NO. 10
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(KAWEAH S.W. QUADRANGLE)

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1976 and 1977 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

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SHEET NO. 11
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(KAWEAH S.E. QUADRANGLE)

This soil survey was compiled in 1979 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1976 and 1977 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 12
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(LINDSAY QUADRANGLE)

R. 26 E. | R. 27 E. | 1 980 000 FEET (Joins sheet 9) 119°00′ 36°15″

330 000 FEET

T. 19 S. — T. 20 S.

Tonyville · Burr · Lucca · Lindsay Peak · Spring · Lewis Creek · Todds Hill · Lance · Park · LINDSAY · Lincoln Sch · Washington Sch · Jefferson School · City Hall · Sta PO · Fayette · Siphon · Olive Cem · Chrysoprase Hill · Sierra Heights · Stout · Gravel Pit · El Mirador · Gillette · Mirador · ECKERT AIRPORT · Strathmore · Water Tank · Sunnyside Sch · Frazier · Frazier Creek · Valley · ELEPHANT BACK · ROUND VALLEY · ROCKY HILL

SOUTHERN PACIFIC · VISALIA ELECTRIC · SANTA FE · ATCHISON TOPEKA · FRIANT KERN CANAL · LINDSAY STRATHMORE IRRIGATION DITCH · LEWIS CREEK ROAD · TULARE HWY · FREMONT TRAIL · HIGHWAY 65 · HIGHWAY 99 · LEVEE · CYPRESS AVE · CHESTNUT AVE · REDWOOD AVE · PALM AVE · HICKORY AVE · FIR AVE · ORANGE AVE · SEQUOIA AVE · CEDAR AVE · OAK AVE · ASH AVE · SPRUCE AVE · POPLAR AVE · WILLOW AVE · BELT AVE · FIRST AVE · SECOND AVE · THIRD AVE · FOURTH AVE · FIFTH AVE · SIXTH AVE · SEVENTH AVE · APRICOT AVE · PEACH AVE · PEAR AVE · PLUM AVE · APPLE AVE · IRIS AVE · PANSY AVE · CANNA AVE · ASTER AVE · MERRITH ST · DINEWCOMB DR · EL MIRADOR HIGHWAY · FRAZIER ATCHISON TOPEKA · ADAMS AVE · LIMIT OF SOIL SURVEY

(Joins sheet 13)

T. 20 S. — T. 21 S.

290 000 FEET

36°07′30″ 119°07′30″ R. 26 E. | R. 27 E. (Joins sheet 15) 2 000 000 FEET

This soil survey was compiled in 1979 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 Scale 1:24000 5000 10000 Feet

Orthophotobase compiled from 1976 and 1977 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

TULARE COUNTY, CALIFORNIA, CENTRAL PART NO. 12

SHEET NO. 12 OF 24

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 13
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(FRAZIER VALLEY QUADRANGLE)

2 000 000 FEET R. 27 E. | R. 28 E. (Joins sheet 10) R. 28 E. | R. 29 E. 118°52'30" 36°15"

330 000 FEET

T. 19 S. — T. 20 S.

(Joins sheet 12) (Joins sheet 14)

T. 20 S. — T. 21 S.

290 000 FEET

36°07'30" 119°00' R. 28 E. (Joins sheet 16) 2 030 000 FEET R. 28 E. | R. 29 E.

Yokohl Valley
Yokohl Valley Road
Yokohl Creek
Lewis Creek
Lewis Creek Ditch
Frazier Valley
Frazier Creek
Campbell Creek
Spanish Camp
Prospect
Prospects
Water Tank
Water Tanks
Oil Tank
Well
Cemetery
Gravel Pit
Campbell
Springs
Spring
JEEP TRAIL
FRAZIER HIGHWAY
ROAD
DITCH
SCHOOL
CHURCH
ROCKY HILLS

This soil survey was compiled in 1979 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1976 and 1977 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 14
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(SPRINGVILLE QUADRANGLE)

This soil survey was compiled in 1979 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1976 and 1977 aerial photography by the U.S. Department of The Interior, Geological Survey.
Planimetric detail obtained from 7½ minute series maps.
10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 15
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(PORTERVILLE QUADRANGLE AND PART OF DUCOR QUADRANGLE)

This soil survey was compiled in 1979 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1976 and 1977 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO.16
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(SUCCESS DAM QUADRANGLE)

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 Scale 1:24000 5000 10000 Feet

This soil survey was compiled in 1979 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Orthophotobase compiled from 1976 and 1977 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

2 040 000 FEET — (Joins sheet 14) — R. 29 E. | R. 30 E. — 118°45′ — 36°07′30″

280 000 FEET

(Joins sheet 16) — (Joins sheet 18)

T. 21 S. | T. 22 S.

250 000 FEET

36°00′ — 118°52′30″ — (Joins sheet 20) — R. 29 E. | R. 30 E. — 2 070 000 FEET

PLEASANT VALLEY
TULE RIVER INDIAN RESERVATION
SEQUOIA NATIONAL FOREST
LIMIT OF SOIL SURVEY
Springville
Snail Head
Rumbley
Water Tank
Ward Spr
Ward Canyon
Ward Mtn
Cow Mtn
Shaft
Globe
Big Campbell
Grahams
Cemetery
water
Prospects
Joaquin Flat
Shafts
Cow Mtn
Soda Springs
Guard Sta.
Cem.
Bonsall Hill
Alkali Flat
Bagby Hill
Oak Flat Peak
Oak Flat
Oat Mtn
Campbell Creek
Pleasant Valley Ditch
Old Railroad Grade
Tule River
Moore Ditch
Graham Ditch
Osborn Ditch
Whitney Ditch
Goat Ranch Road
South Fork Tule River
Crew Ditch
Prospects Creek
Duncan Canyon
Blue Canyon
Cow Mtn Spring
Long Branch
Gibbons Spring
Bond Creek
Rocky Creek
Can Creek
Pothole Road

This soil survey was compiled in 1979 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 Scale 1:24000 5000 10000 Feet

Orthophotobase compiled from 1976 and 1977 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 18
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(CAMP NELSON S.W. QUADRANGLE)

This soil survey was compiled in 1979 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1976 and 1977 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 19
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(FOUNTAIN SPRINGS QUADRANGLE)

This soil survey was compiled in 1979 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1976 and 1977 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 20
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(GIBBON PEAK QUADRANGLE)

This soil survey was compiled in 1979 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

Orthophotobase compiled from 1976 and 1977 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 21
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(CALIFORNIA HOT SPRINGS N.W. QUADRANGLE)

2 080 000 FEET — (Joins sheet 18) — R. 30 E. | R. 31 E. — 118°37′30″ — 36°00′

240 000 FEET

T. 22 S. — T. 23 S.

(Joins sheet 20)

TULE RIVER INDIAN RESERVATION

PARKER PEAK GROVE

NORTH COLD SPRING GROVE

McDermott Camp

Redwood Corral

North Cold Spring

North Cold Spring Peak

Millard Corral

Lone Pine Mountain

Gordon Hills

Devils Den

Bond Creek

Beaver Creek

Redwood Creek

Eagle Creek

Rattlesnake Ridge

North Fork South Fork

Frankum Ranch

Devils Thumb

Gordon Creek

Thompson Peak

Thompson Ridge

Skunk Spring Saddle

Skunk Spring

Cain Spring

Corral Hill Camp

Thompson Camp

Pinnell Springs

Cain Spring Gap

Prison Oak Spring

Cold Creek

Stone Place (Ruins)

Prospect

Tunnels

Sycamore Gap

Deer Creek

Bull Point Mine

Tyler Peak

Tyler Creek

Tyler Creek Fire Control Station

Jon Hill

SEQUOIA NATIONAL FOREST

LIMIT OF SOIL SURVEY

S. N. F.

T. 22 S. — T. 23 S.

(Joins sheet 20)

200 000 FEET

T. 23 S. — 35°52′30″ — 118°45′

(Joins sheet 24) — R. 30 E. | R. 31 E. — 2 110 000 FEET — T. 24 S.

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 Scale 1:24000 5000 10000 Feet

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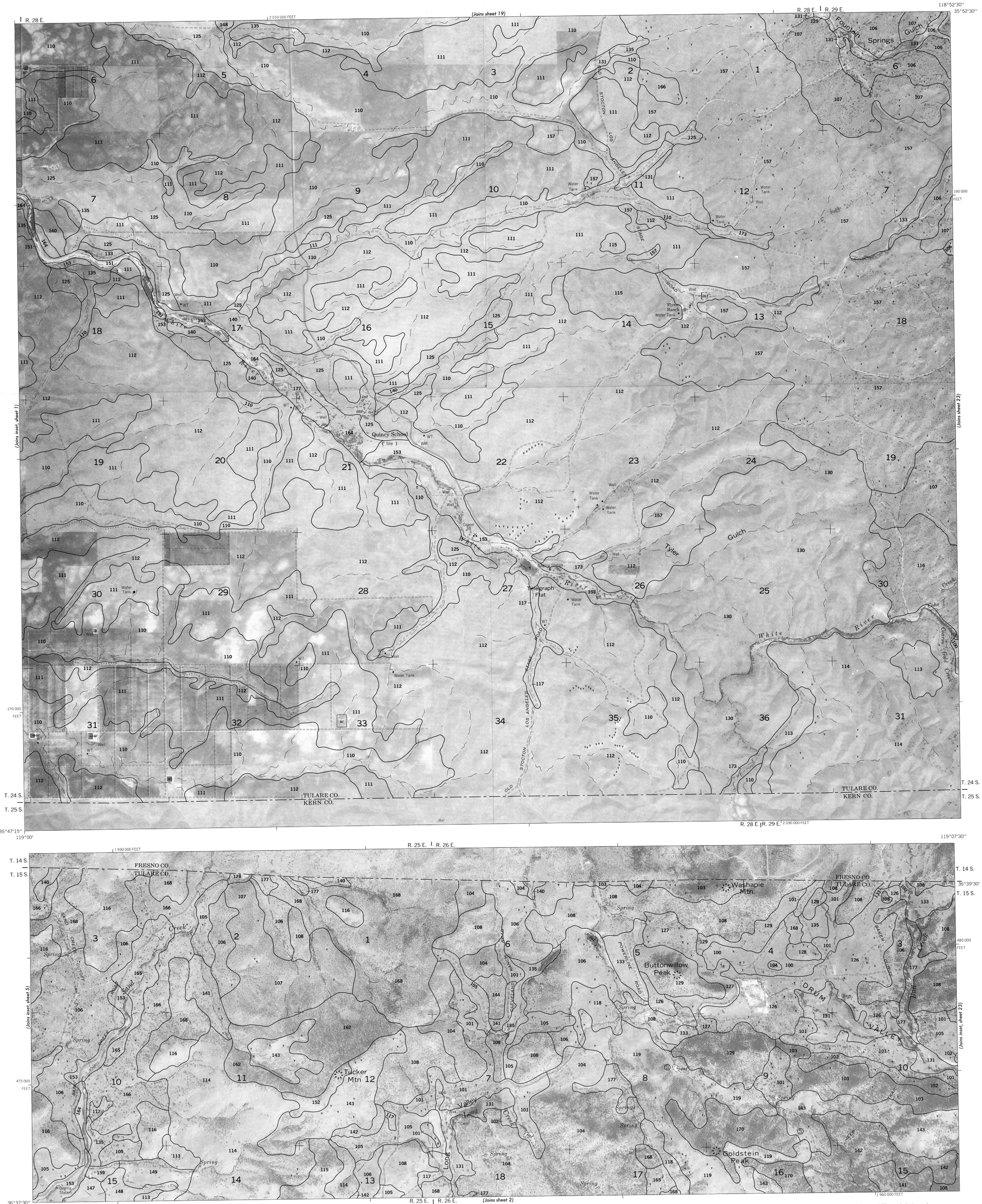
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 22
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(QUINCEY SCHOOL QUADRANGLE) AND PART OF TUCKER MTN. QUADRANGLE)



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Orthophotobase compiled from 1976 and 1977 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 23
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(WHITE RIVER QUADRANGLE AND PART OF MIRAMONTE QUADRANGLE)

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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 24
TULARE COUNTY, CALIFORNIA, CENTRAL PART
(CALIFORNIA HOT SPRINGS S.W. QUADRANGLE AND PART OF GIANT FOREST N.W. QUADRANGLE)

2 080 000 FEET — (Joins sheet 21) — R. 30 E. | R. 31 E. — 118°37'30" — 35°52'30"

King George Ridge — King George Peak — UHL Pocket — UHL Hill — Cedar Spring — UHL POCKET ROAD — Turner Peak — Grassy Canyon — Canyon — LIMIT OF SOIL SURVEY — Bald Knob — Railroad Canyon — Turner Flat — Pumpkin — Cove Canyon — RIVER — Lone Pine Canyon — SEQUOIA NATIONAL FOREST — WHITE — Devils Kitchen — Bear Trap Canyon — Rail Flat — Buck Peak — Yellow Jacket Canyon — Rail Ridge — Oak Flat — Spring — Twin Peak — Trap Canyon — Carver Peak — Joe Bowen Canyon — Quail Flat — Grist Mill Peak — RED GRADE — Pond — Vincent Ranch — Idlewild — Posey — Creek — Balance Rock — Spears — Tungstore Mine — SEQUOIA NATIONAL FOREST — LIMIT OF SOIL SURVEY

190 000 FEET

(Joins sheet 23)

T. 24 S. — T. 25 S. — TULARE CO. / KERN CO.

T. 14 S. — T. 15 S. — FRESNO CO. / TULARE CO.

2 000 000 FEET — R. 27 E. | R. 28 E. — 118°55'45" — 36°39'15"

(Joins inset, sheet 23) — 160 000 FEET — 475 000 FEET — 480 000 FEET

Sierra Glen — Creek — Ditch — SEQUOIA NATIONAL FOREST — LIMIT OF SOIL SURVEY

36°37'30" — 119°00' — R. 27 E. | R. 28 E. — (Joins sheet 4) — 2 020 000 FEET

36°37'30" — 118°45' — R. 30 E. | R. 31 E. — 2 110 000 FEET

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10 000 Feet

Scale 1:24000

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